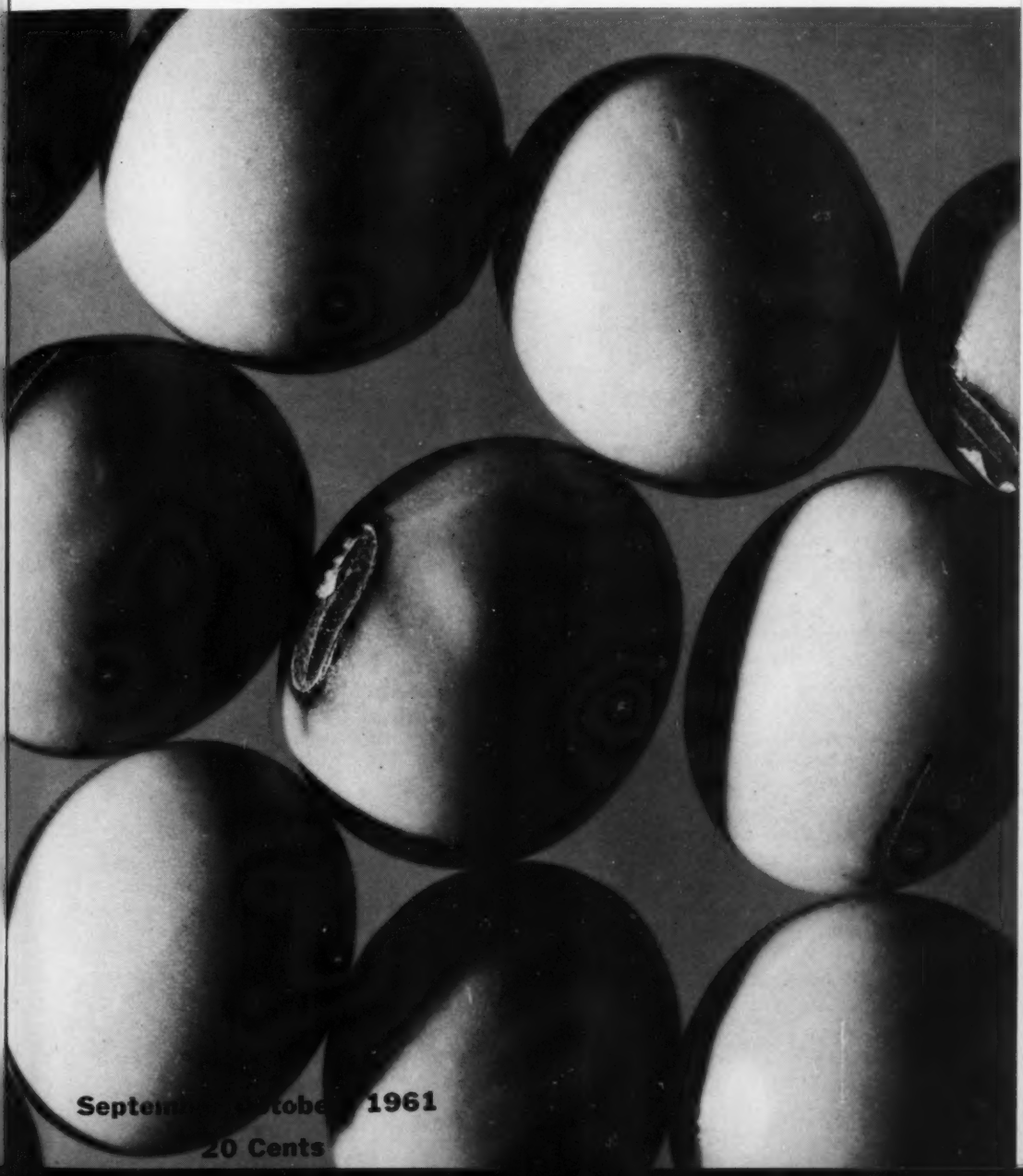
Better Crops

WITH PLANT FOOD

AN AMERICAN POTASH INSTITUTE PUBLICATION

IN ITS 39TH YEAR



Septem[illegible]tobe[illegible] 1961

20 Cents

Better Crops
WITH PLANT FOOD

The Whole Truth—Not Selected Truth
$1.00 for 6 Issues, 20¢ Per Copy

Vol. XLV Washington, D. C. No. 5

Copyright 1961 by American Potash Institute

Santford Martin, Editor
Selma Bushman, Assistant Editor
Barbara Martin, Circulation

Published bimonthly by
The American Potash Institute Inc.
1102 16th Street, N.W.
Washington 6, D. C.

Washington Staff:
H. B. Mann, President
J. W. Turrentine, President Emeritus
J. D. Romaine, Vice Pres. and Secretary
E. D. Dixon, Asst. Treasurer
S. W. Martin, Publications
Mrs. H. N. Hudgins, Librarian

Regional Directors:
J. F. Reed, Decatur, Ga.
W. L. Nelson, West Lafayette, Ind.
Roger P. Humbert, Los Gatos, Calif.
R. E. Wagner, Washington, D. C.
K. M. Pretty, Port Credit, Ont.

Agronomists:
C. W. Summerour, Montgomery, Ala.
N. D. Morgan, Shreveport, La.
E. H. Bailey, Starkville, Miss.
J. E. Sedberry, Raleigh, N. C.
H. L. Garrard, Noblesville, Ind.
G. A. Wickstrom, Columbia, Mo.
R. D. Munson, St. Paul, Minn.
F. S. Fullmer, Newport Beach, Calif.
G. H. Braun, Portland, Oreg.
W. K. Griffith, Washington, D. C.

CONTENTS

Keeping Country-minded Often Sticks 1
By Jeff McDermid

Boost Seed Production And Yields Of Later Crops With Fertilizer 4
By Paul M. Burson and Henry W. Kramer

Turf Grass Need For Lime & Fertilizer . . . Pinpointed By Soil Test Summaries 12
By J. R. Miller

Johnsongrass—A Real Hay-maker 18
By E. H. Bailey

Much More Lime And Fertilizer Needed Soil Tests Show 24
By B. N. Driskell

Basic Principles For A Corn Fertilization Program 30
By George D. Scarseth

A Colorimetric Quick-test . . . For Soil Moisture 38
By Seton N. Edson

Why Not Excellent Papers? 40

"Plant Food Makes 'em Big!" 43
By Mary Allen

Four And Two—Twice A Year 46
By T. S. Buie

ON THE COVER

. . . what multiple uses lie in this little bean! Soybean production has grown from 180 million bushels at the end of World War II to 550 million bushels in 1960. One reason: The extensive uses to which soybean oil and meal, as well as forage and human food, have been put. How many more uses will be found? Only research and time will tell. Turn to page 9 for the newest use. *USDA PHOTO*

Member Companies
AMERICAN POTASH & CHEMICAL CORPORATION • DUVAL SULPHUR & POTASH COMPANY
POTASH COMPANY OF AMERICA • SOUTHWEST POTASH CORPORATION
UNITED STATES BORAX & CHEMICAL CORPORATION

Although you may get your food with a pipe wrench instead of a plow . . .

KEEPING COUNTRY-MINDED OFTEN STICKS

By Jeff McDermid
(Elwood R. McIntyre)

THINKING farmwise has undergone a change of front in recent decades. More social and educational aids to better farming and rural life exist today through 4-H clubs and Future Farmers. But these teaching agencies do not always confine their leadership strictly to the rural farm environment. Their aim is to unite the modern youngsters of open country with their urban counterparts.

But actual life and work on the farm, even in this age of instant communication, still keeps young folks "country-minded"—in a definite way not usually possessed by their city cousins.

To some city-bred folks, "country-minded" means being ornery and unwilling to think in a definite pattern. They forget that the farmer is like the poetical description of youth—"the thoughts of a boy are long, long thoughts." Habits of solitary work afield induce more or less retrospective thinking and stir visions of equality, farm rights, and incentives to produce abundantly.

Country-minded men come from city offices with a smile when rain breaks a long dry spell, and they scan the skies like sailors during hay time. There is a constant fraternity of feeling among those who rejoice in their rural origin. The power of that rural environment to color the ways you approach a subject is amazing. Memories of personal experiences is the right answer. It may be mixed sometimes with backgrounds of drudgery and misunderstanding, yet it is always there through thick and thin.

Of course, the countryside itself has changed. The little white meeting house is lightly attended, if at all, on somnolent summer Sundays. Perhaps the moss-grown churchyard with its broken tombstones no longer brings the "elegy" to mind. The high-powered clergyman and the vested choir in the city 15 minutes and 10 seconds away have cut many a rural church's collection plate toward zero.

What attitude toward organized labor governs the majority of our country-

minded? Much of the life and work on farms is a tribute to the soil itself, to the pulse of nature, and dedicated to the task done to a finish, rather than to the tune of a paymaster. Here we dimly see signs of a new attitude, albeit mainly a political one.

Neighborliness remains a dominant aspect of country life, even with the car, the radio, and the T.V. set in our midst. Where is there a country-raised person stifled inside a city flat who has not wondered how folks could so long remain unacquainted with each other and so shy of indulging in some friendly gossip? Mother could spin such delightful yarns about the newcomers from Iowa and their little foibles that they sounded like fiction characters. Knowing, testing, and trusting your neighbors seems to be an art of strong development in the country-minded.

Another unfailing trait of the country-minded is their usual reserve power of patience—a willingness to bide awhile and wait and see. The age-long struggle against bugs, blights, frost, hail and crop failure makes for a rather stoical sort of inward philosophy. A remnant of the old spirit which accepts the inevitable and faces tribulations with courage had its origin in the carving of farm lands out of the American wilderness.

Arising from that same trait in the country mind is the saving grace of good humor. There is more man-sized appreciation of the ridiculous and the witty in our rural communities than we see elsewhere.

The shortcomings of the country-minded in their attitudes are not serious. One main fault harks back to copy-book platitudes. Take the case of producers versus consumers as often expressed by rural minds. My uncle could get real tearful over the home farm and its God-given heritage. He and others would argue that non-farmers were parasites, that all city folks were consumers and farmers were the main producers. This tendency to glorify all that is bucolic with tender allegory and plaster it with mawkish praise is just as unseemly and untrue as to claim that the countryside is the abiding place of the pure and the meek.

At any rate we who think we have the trait of being sympathetic with farming yearn to mingle with those who possess it. Yet to be honest about it, too few of us farm-reared persons would again clasp the plow handles, feed the cattle, brave the elements, and assume a hefty mortgage to boot. *Thinking* like farmers is about as close as we care to come to it, but in political matters that is often a practical substitute. If we can't raise pork, we can perform at the polls.

Let's hope that you had a country-minded teacher back there in the one-room district school. We used to sit there in school and look off across the fields through the open door in mild fall weather and imagine a lot of things and try to figure out the why and wherefores. Printed geographies told us about faraway places we never expected to see. But it never stopped us from thinking what made the seasons different. We'd sit there and peer around the edges of our school books at the sunshine and the gaudy tints in the autumnal forest and the rich colored blossoms in the weedy pasture that was close up to our school house. We pestered the teacher and the home-folks for correct answers about things that made us wonder and think.

We asked ourselves about the fairy rings in the grass, the number of toads hopping around after a shower, and what caused those filmy webs floating in the air—and why hummingbirds built nests shaped like a thimble while swallows plastered mud under the eaves. Why did our dog turn around three times before lying down to sleep? Why did grazing cows all move along facing in the same direction? We were real childish about our ques-

tioning. You have to be that way, we figured, or you won't learn much about the little things that make the world so big.

While I was a kid in our valley school, the closest we ever came to finding literature that gave us the kind of answers in the kind of language we wanted to hear were some bulletins on nature lore, sent us from Cornell University, back there in York State somewhere. We were tickled with them, but it was years before I found out who was responsible.

You have guessed it—Liberty Hyde Bailey. For many years, he put questions to himself and when he got the right answers by his own discoveries or from other horticulturists, he kept on publishing the results for anyone like us kids, who thirsted for such information.

More than half the kids who went to our district school grew up to be city workers and dwellers. Only a few of them ever had a high school education. But they kept on being country-minded through all the subsequent years.

One of them turned out to be a tip-top plumber. I visited him a few years ago, and he drew a lot of faded folders out of his desk. They were the same Cornell nature study bulletins of 45 years ago. So you see the idea of keeping country-minded often sticks, even though you get your food with a pipe wrench rather than a plow.

THE END

Western Turfletter Says:

PASS . . . OR BE BY-PASSED

Today, few of us worry about soil texture, structure and porosity. The term 'colloids,' 'interface' and organic content have little meaning. But we'll probably be tossing them around with ease in the not too distant future. We will or we'll be passed by in the turf management business!

This is turf progress brought about by recent soils research work. A clearer picture has been focused for us and a more definite view of putting green soil mixtures is now possible. The old time ratio of 1 part soil, 1 part sand and 1 part peat is no longer valid. The Green Section plans to publish definite recommendations for putting green soil mixtures in the near future. These recommendations will be based on research principles just as applicable in Seattle as they are in San Diego. They will represent over five years of research work on the subject.

As more experience is gained in using these mixtures, one point becomes increasingly clear. If they are to succeed, the architect or superintendent must follow the soil recommendations TO THE LETTER. There can be no "last minute" changes. Jim Holmes, Mid-Continent Green Section Agronomist says, "The new soil mixtures for putting greens will work, but *all* recommendations must be carried out. There is no sense in considering them if you intend modification. This can only lead to trouble."

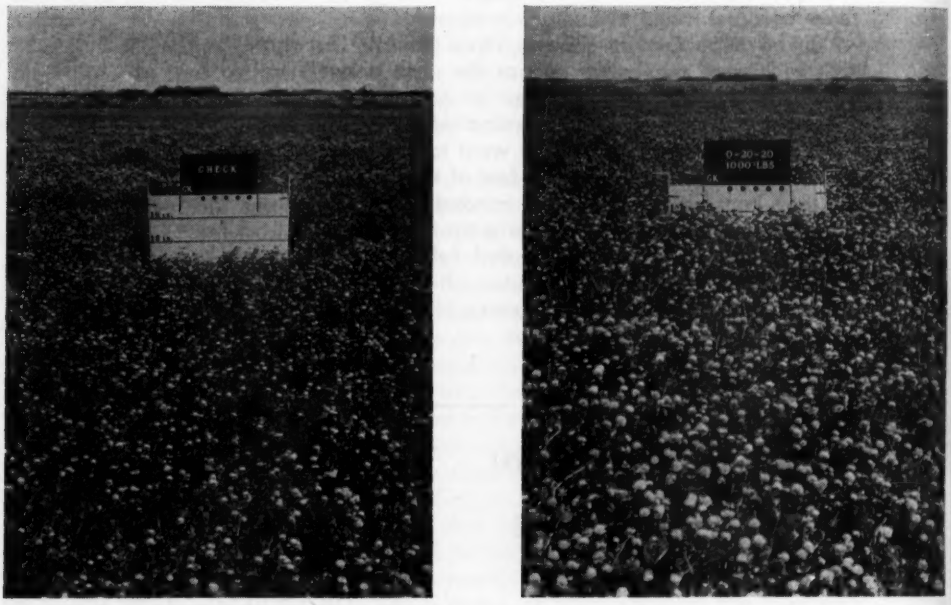
A Touch of 'Soils'

The soil, as we ordinarily know it, is made up of a mass of solid particles with spaces between them. The solids may vary from rocks and stones to a size so small that only a microscope can detect them. The latter range size is often referred to as "colloidal" and is exemplified by muddy water, which is nothing more than small clay particles in suspension. By grouping the different particles size ranges of a soil, we define gravel, sand, silt and clay. These are termed "soil sep-

Continued on page 17

Figure 1—This shows direct response of alsike clover to fertilizer.

From Check: Only 154 lbs. Seed **From 1,000 lbs. 0-20-20: 657 lbs. Seed**



BOOST SEED PRODUCTION AND YIELDS WITH

By Paul M. Burson
And
Henry W. Kramer

LEGUMES are important to agriculture for many reasons:

1 Because they provide excellent forage.

2 Because they are one of the finest livestock feeds.

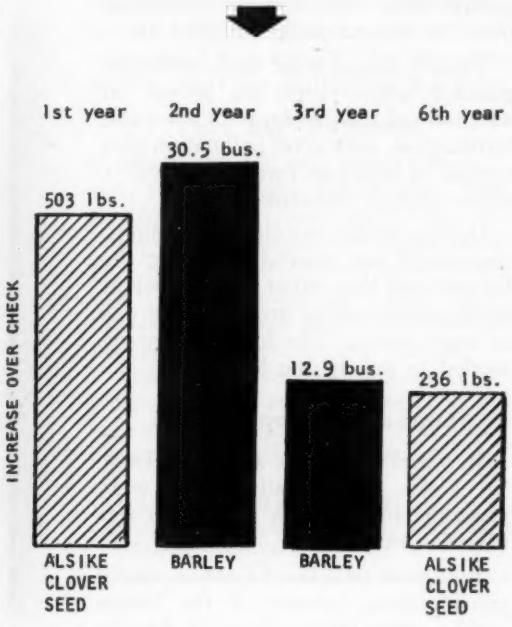
3 Because they are essential to a sound fertility, management, and land-use program.

As legume acreage increases, greater quantities of seed are needed.

In the past, Minnesota had a flourishing legume seed industry, at times holding first place in the production of alfalfa, alsike clover, and sweet clover seed. Today all other legume seed producing states surpass Minnesota in production of alfalfa and red clover seed, while total production has declined to the point where many producers have gone out of the "seed" business. Why? *Because of declining seed yields per acre.*

The most important problems facing the seed producer today are soil type selection, fertilization, adequate

Figure 2—Direct and residual responses from 1,000 lbs. of 0-20-20 applied first year on alsike clover only.



OF LATER CROPS

FERTILIZER

University Of Minnesota

pollination, and insect control.

Research work and observations by the Department of Soils have indicated that soil type, drainage, and proper fertilization are important basic soil factors in legume seed production. A certain soil type may be suitable for one legume crop but not for another.

A legume plant will not produce seed abundantly unless it has an adequate and balanced nutrient supply on properly selected soil conditions. Results show a relationship between soil type conditions for different legume crops, proper fertilization, and seed production.

Observations further suggest a possible relationship between soil conditions, fertilization, and the attractiveness of the plant to pollinators, such as bees. In this report, responses of legume seed production to fertilizers are featured, as well as responses on succeeding crops grown in the rotation system.

Fertilizer applied the first year for alsike clover gave excellent residual response even up to the sixth year. Value of the increase over cost of fertilizer ($34) totaled $211.50 for the six years.

Effective Treatments

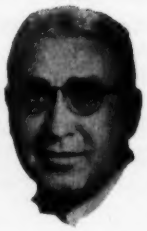
Since 1952, over 40 different fields of all four legume seed crops have been studied. Phosphate and potash rates used in the different years are shown below (Table 1).

TABLE 1. FERTILIZER USED IN THE EXPERIMENTAL FIELDS.

Grade	1952–55 lbs/A	1956–58 lbs/A
0–0–0	(Check)	(Check)
0–20–0	500	300
0–20–0	1,000	500
0–20–20	500	300
0–20–20	1,000	500
0–20–40	500	300
0–20–40	1,000	500

Fertilizer treatments were replicated four times in each field. All fertilizer was applied broadcast either at seeding

Paul M. Burson is Professor of Soils at University of Minnesota. He supervises operations on the Rosemount Soils Research Farm and is chairman of an interdepartmental Grassland-Beef Cattle project on the farm. He conducts soil fertility research, including work on legume and grass seed production and teaches a beginning soil management course for agricultural students. A Minnesota native, he earned his B.S. and M.S. from Iowa State University.



time or topdressed in early spring of the year the crop was to produce seed. No differences were noted as result of fertilization time. The legume stands were equally good in all cases except where the legume was not adapted to the soil conditions, such as too wet or too dry for the particular crop in a certain year.

The phosphate and phosphate + potash treatments were made according to soil test. All plots were sprayed with DDT emulsion spray at 1½ to 2 lbs. per acre when flowering started. Adequate pollination was provided in all fields.

These experiments were carried out in the northern one third of the state since the climate there is most favorable for legume seed production.

It's the Yield That Counts

In Table 2, the acreage yields of the four seed crops are given for the best fertilizer treatments in those fields where the legume crop was definitely adapted to the soil type conditions. These are compared to the average yield of these seed crops for Minnesota over the 10-year period of 1942-51.

Table 3 shows what seed yields are possible when crops are grown on adapted soil conditions, with adequate fertilization, with good pollination plus control of injurious insects. Figure 1 shows growth response.

Under usual farming operations, seed fields are plowed following the harvest and then other crops (such as small grains or flax) are grown for one or more years. The land is then reseeded to one of the legumes.

Succeeding Crops Benefit

Residual effects are shown in Table 4. Yields of succeeding crops were generally higher from the higher fertilization rates.

Results on field No. 5 deserve special consideration because of the longer yield records (Figure 2 and Table 4). On this field the fertilizer was applied for alsike clover. Seed yields were increased 503 lbs. per acre on the 1000 lbs. of 0-20-20. When two crops of barley followed, residual effects were pronounced.

In the fourth year the land was in fallow and this was followed again by barley. Yields were not determined on the barley the fifth year, although

TABLE 2. STATE AVERAGE COMPARED WITH BEST TREATMENT—SHOWING HOW AVERAGE YIELD OF SEED FROM THE BEST TREATMENTS AND SOIL CONDITIONS IN EXPERIMENTAL FIELDS FAR SURPASSED AVERAGE SEED YIELD OF EACH CROP FOR THE STATE.

Crop	Average yield Minnesota, 1942–51*	Average yield, best treatment experimental fields
	(Pounds per acre)	
Alsike clover	114	808
Red clover	59	761
Alfalfa	49	740
Sweet clover	180	1,438

** Acreage, yield, and production of field seed crops. Revised estimates 1939-51 by States.* USDA Bureau of Agricultural Economics, June, 1952.

very definite effects from fertilization were observed.

Alsike clover again was seeded with the fifth-year barley and a crop of seed taken in the following year which was the sixth year following fertilizer application. Yields of alsike clover seed were still increased 236 lbs. per acre on the 1000 lbs. of 0-20-20 per acre.

Henry W. Kramer is senior Plot Supervisor for the University of Minnesota Soils Department. Connected with the soils staff from time to time since 1922, he started as a soil surveyor. Since 1939, he has been plot supervisor for out-state fields. Now works out of Wilton, Minnesota.

Pays Big Dividends

Using present day prices, the annual yield increases clearly show that the residual carry-over effects on the crops which followed the alsike clover seed paid for the fertilizer many times over. Furthermore, these data show that higher rates of fertilization usually produce greater carry-over effects.

This emphasizes the importance of making fertilizer applications heavy enough to supply all the nutrients needed to produce maximum crop yields under prevailing soil and weather conditions. These consistent residual yield increases can be expected to carry through anywhere from 2 to 6 years or possibly more, after the initial fertilizer application.

The question now being asked by farmers in the legume seed producing areas of northern Minnesota is, "What can this fertilization program mean to me on my farm in economic returns?"

TABLE 3. HOW FERTILIZER INFLUENCED SEED YIELDS ON REPRESENTATIVE FIELDS WITH PROPER SELECTION OF SOIL, ADEQUATE POLLINATION AND THE CONTROL OF INJURIOUS INSECTS.*

Crop	Year	Yields in lbs. per acre			Fertilizer Rate per acre
		No fertilizer	With fertilizer	Increase from fertilizer	
Alsike clover	1952	154	691	537	0-20-20 (1,000 lbs.)
Alsike clover	1953	236	685	449	0-20-20 (1,000 lbs.)
Alsike clover	1953	368	808	440	0-20-40 (1,000 lbs.)
Red clover	1953	387	662	175	0-20-40 (500 lbs.)
Red clover	1954	397	761	364	0-20-20 (500 lbs.)
Alsike clover	1954	297	691	394	0-20-40 (1,000 lbs.)
Alfalfa	1954	322	740	418	0-20-20 (1,000 lbs.)
Sweet clover	1955	1,078	1,438	360	0-20-0 (1,000 lbs.)
Alsike clover	1956	54	308	254	0-20-40 (300 lbs.)
Alsike clover	1957	188	427	239	0-20-20 (300 lbs.)
Alsike clover	1958**	181	710	529	0-20-20 (500 lbs.)
Sweet clover	1958**	674	1,032	358	0-20-20 (500 lbs.)

* Most of the pollination was by honey bees located near the experimental fields.
** In 1958 the entire plot areas were sprayed to control injurious insects.

TABLE 4. RESIDUAL OR CARRY-OVER EFFECT OF FERTILIZER APPLIED FOR LEGUME SEEDING. ALL THE FERTILIZER APPLIED FOR 1ST YEAR CROP.

Field No.	Year	Crop	Check	0-20-0 500 lbs.	0-20-0 1000 lbs.	0-20-20 500 lbs.	0-20-20 1000 lbs.	0-20-40 500 lbs.	0-20-40 1000 lbs.
1	1st	Red clover seed*	84 lbs.	80	78	93	108	94	94
	2nd	Corn	42.9 bu.	56.3	60.8	84.4	83.6	86.3	89.1
2	1st	Red clover seed	129 lbs.	135	159	129	128	166	157
	2nd	Corn silage	20 tons	23	23	26	26	23	24
3	1st	Red clover seed**	166 lbs.	235	222	240	267	216	211
	2nd	Flax	16 bu.	21	22	22	24	22	23
4	1st	Red clover seed	387 lbs.	670	653	654	637	662	622
	2nd	Red clover seed	151 lbs.	245	287	281	271	302	280
5	1st	Alsike clover seed	154 lbs.	570	620	641	657	614	691
	2nd	Barley	32 bu.	51.5	57.8	59.0	62.5	60.4	60.7
	3rd	Barley	37.4 bu.	51.6	52.7	51.0	50.3	44.4	50.5
	4th	Fallow							
	5th	Barley	visible increase in yield from fertilizer. (No yields taken)						
	6th	Alsike clover seed	145 lbs.	267	330	264	381	278	352

* Inadequate pollination and first crop clipped too late for good seed set.
** Fertilizer rates at 300 and 500 lbs. per acre instead of 500 and 1000 lbs. per acre.

The dollar return for fertilizer over fertilizer cost ranged from $3.00 for each $1.00 spent the first year to as high as $9.00 return for a total 6-year residual response.

Field No. 5 illustrates what these dollar returns over fertilizer cost would mean. The 0-20-20 fertilizer gave the most consistent increase in crop yields for the 6 years. Returns the first year, as well as the 6-year total are shown below. The second 500 lbs. of fertilizer returned $47.50 per acre for $17.00 per acre additional investment in fertilizer. Crop prices were figured on the current farm price.

	Cost of Fertilizer	Acre Returns Over Cost of Fertilizer	
		1st year	Total 6 years
500 lbs. 0-20-20	$17.00	$129.10	$164.00
1,000 lbs. 0-20-20	$34.00	$116.90	$211.50

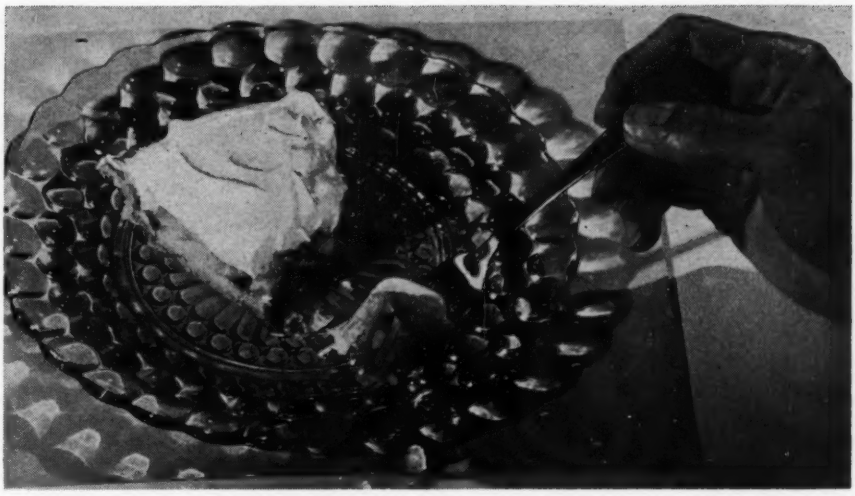
If a typical 50 acre Minnesota field was cropped in the same way as field No. 5, the *return over fertilizer cost* would amount to *$8,200.00 for the 500 pound rate* as compared to *$10,575.00 for the 1,000 pound rate* for the 6-year residual period.

The difference in return between the two rates, then, is $2,375 in favor of the 1,000 pound rate. This means that *the second 500 pounds per acre of fertilizer added to the 50 acre field brought this additional return.*

How much longer these residual responses may continue beyond the 6 years is not known, but such a fertility program is now in progress on the other 4 fields. These fields are being cropped with different kinds of crops and in a different sequence than field No. 5, but all are showing similar yield increases and similar ratios of dollar returns over fertilizer costs for the different crops.

There is no substitute for good soil fertility and management. It is the best insurance and investment a farmer can make, no matter how large or how small his scale of farming operations may be. The goal of proper fertilizer-management is higher yields at a lower cost per bushel or pound.

THE END



USDA chemists have developed another use for soybeans—protein gels and foams. The meringue on this pie came from soybeans. The foams are unusually stable—several times more stable than other whipping materials tested. Both gels and foams are edible and may be flavored and colored. The foams may also be used in cake frosting and ice-cream toppings.

. . . This Time Edible Gels And Foams From Soybeans

EDIBLE GELS and foams made from refined soybean protein, potentially useful as food and industrial products, have been produced by USDA chemists to find additional market outlets for soybeans.

The new products, developed at the Northern Utilization Research and Development Division, Agricultural Research Service, in Peoria, Ill., can add variety to diets and improve nutrition, especially in countries where meats are less plentiful than they are in the United States. A combination of the refined soybean protein and cereal products, the researchers believe, would provide a diet well-balanced in amino acids.

The gels and foams may also prove useful in industry—for example, as glues, binders, coatings, and thickening agents. The gels revert to liquid when heated and thicken again when cooled. They are the first heat-reversible gels to be made from a vegetable protein.

Development of pilot-plant procedures for producing the new gels and foams has not yet been attempted. But the simplicity of the laboratory procedures—plus the commercial availability of the starting material, soybean protein—indicates commercial production would be feasible.

The soybean protein used in making the gels and foams was extracted by acid precipitation from soybean meal. The extracted protein was treated with an alcohol solution to remove water and fatty materials (lipids), then neutralized with sodium hydroxide. The resulting product was sodium proteinate, which is soluble in water. If heated and whipped, proteinate solutions form foams; if allowed to cool, they form gels. When reheated, the gels return to liquid. —*From USDA Report*

In Soybean Production . . .

"SOME GOT IT!"

YOU'VE heard the old expression, "Some got it, some ain't!"—referring, of course, to the varying talents of people, to the great baseball pitcher or football passer, to the case-winning lawyer or top-producing farmer.

Well, soybeans—like people—must be nourished right to produce to the best of their ability. Whether they got it or "ain't" often depends on how properly or improperly limed and fertilized they are. The picture-story on this spread speaks volumes.

It is a study in contrasts.

Note the high fertility soybeans. Properly limed and fertilized, the plants are vigorous. They fill the row. Their leaves, the manufacturing centers for

Pictures by W. L. Nelson and H. L. Garrard

"SOME AIN'T!"

carbohydrates, are large. In other words the plants appear to be dark green and fat.

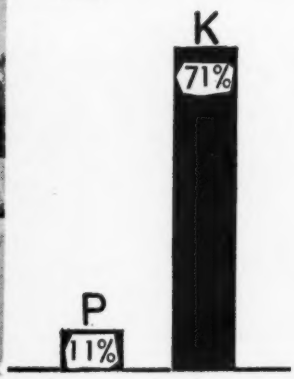
Note the low fertility soybeans. Improperly limed and fertilized, the plants are upright and narrow. The leaves are small and are not able to take full advantage of the sunlight. The plants are skinny and show signs of insufficient attention. On some soils severe potash hunger may appear.

What is the remedy? A soil test with lime and fertilizer applied according to recommendations is the best remedy for this low fertility condition. What do your soybeans need? Have you applied the remedy?

THE END

On Golf Greens, the need for potash was striking

Soil Samples low to medium in P and K levels. (112 tested)



TURF GRASS NEEDS FOR LIME & FERTILIZER

By J. R. Miller

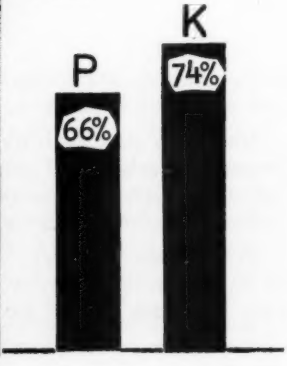
WHAT kinds and amounts of lime and fertilizer do I need to grow a good lawn?

This question is often asked by homeowners and others interested in growing turf grasses. In recent years, turf fertility research—combined with soil test summaries of turf soils—have helped reveal the lime and fertilizer needs of turf grasses.

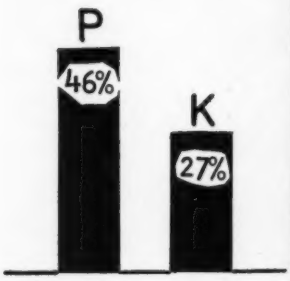
Many soils in the eastern United States are so acid that they need lime to grow turf grasses successfully. Most grasses recommended for lawns and golf

On New Lawns, need for both phosphate and potash ran high

Soil samples low to medium in P and K levels. (107 tested)



Soil samples low to medium in P and K levels. (80 tested)



On Fairways, phosphate needs ran ahead of potash

. . . PINPOINTED BY SOIL TEST SUMMARIES

University of Maryland

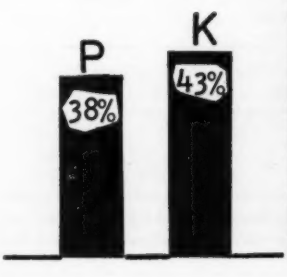
courses grow best in soils with a pH of about 6.5

A recent summary of more than 1,000 soil samples from established lawns in Maryland showed 59 per cent of the soils below pH 6.1 and in need of lime (Table 1). With lawns to be planted, the need for lime was even greater, as 75 per cent of the soils tested below pH 6.1.

It is interesting to note in the pH summary for fairways and greens that only 23 per cent of the samples from greens tested lower than pH 6.1, while 55 per cent of the samples from fairways tested lower than pH 6.1 (Table 2).

On Established Lawns, potash needs ran ahead of phosphate

Soil samples low to medium in P and K levels. (1076 tested)



The golf course superintendent of Ocean City (Md.) Golf Course, George Gumm (right), and county agent Roy Porter inspect the fairway turf. Gumm, a strong advocate of soil testing, has the soil tested each year to determine turf needs.

Lime not only corrects soil acidity, but also supplies calcium or calcium and magnesium (dolomitic liming materials), which are essential plant food elements. Since magnesium is often low in many of the sandy soils of the Coastal Plain, high magnesium liming materials or other sources of magnesium should be applied to prevent possible magnesium deficiency.

A much larger percentage of the lawn soils show low magnesium in Maryland's Coastal Plain than in the Piedmont section, according to soil test summaries of these two regions (Table 3).

Other important functions of lime include:

1 Increases the availability of phosphorus and other plant food elements in the soil.

TABLE 1. SUMMARY OF pH READINGS FOR MARYLAND SOILS FROM LAWNS TO BE PLANTED AND ESTABLISHED LAWNS

Area Tested	No. of Samples	pH of Soils Tested* 3.5–5.0	5.1–6.0	6.1–6.5	6.6+
		%	%	%	%
Lawns to be planted	107	26	49	20	5
Established lawns	1076	14	45	24	17

* pH is a term used to designate the degree of acidity or alkalinity. At pH 7.0 the soil is neutral. As the values go downward from pH 7.0, the acidity increases. Most turf grasses grow best in soils that have a pH of about 6.5.

2 Indirectly improves the structure of heavy soils.

3 Promotes bacterial activity in soils.

P & K Needs of Turf Soils

Turf grasses need relatively large quantities of nitrogen, phosphorus, and potassium.

For example, O. J. Noer and J. E. Hamner found that Bermuda-grass (clippings only) will remove annually from the soil 5.62 pounds of nitrogen, 1.48 pounds of phosphate, and 3.36 pounds of potash per 1,000 square feet of area.

The amount of supplemental nitrogen, phosphorus, and potassium needed will depend on the fertility level of the soil, species grown, clipping management, etc. The following soil test summaries, showing the phosphorus and potassium status of turf soils from Maryland, reveal interesting facts about fertilization of turf grasses.

New and Established Lawns

In the summary of soil samples from lawns, it is interesting that phosphorus and potassium levels were considerably lower for new lawns (lawns to be planted) than for established lawns.

From new lawns, 66 per cent of the soil samples showed low to medium in phosphorus, 74 per cent low to medium in potassium. The balance, of course, was high in P and K.

From established lawns, 36 per cent of the samples showed low to medium in phosphorus, 43 per cent low to medium in potassium. The balance, of course, was high in P and K.

Since the soils from lawns to be planted (new lawns) are often lower in phosphorus and potassium, fertilizers with a nitrogen (N), phosphate (P_2O_5),

TABLE 2. SUMMARY OF pH READINGS FOR MARYLAND SOILS FROM FAIRWAYS AND GREENS

Area Tested	No. of Samples	pH of Soils Tested 3.5–5.0	5.1–6.0	6.1–6.5	6.6+
		%	%	%	%
Fairways	80	3	52	36	9
Greens	112	2	21	46	31

TABLE 3. SUMMARY OF MAGNESIUM SOIL TEST RESULTS FOR COASTAL PLAIN AND PIEDMONT SOILS FROM LAWNS TO BE PLANTED AND ESTABLISHED LAWNS IN MARYLAND.

Area Tested	No. of Samples	Mg Level of Soils Low	Med	High
		%	%	%
Coastal Plain				
Lawns to be planted	26	62	19	19
Established Lawns	110	48	22	30
Piedmont				
Lawns to be planted	53	23	39	38
Established Lawns	380	16	33	51

potash (K_2O) ratio of 1-2-2 or 1-1-1 are generally recommended for establishing turf, while a 2-1-1 ratio is often suggested for maintenance of lawns.

Greens and Fairways

In the summary of soil samples from fairways and greens, it is interesting to note the large percentage of greens testing low in potassium and very high in phosphorus.

From greens, only 11 per cent of the soil samples showed low to medium in phosphorus, *71 per cent low to medium in potassium.* In fact, 65 per cent of the greens samples showed *very high* in phosphorous.

From fairways, 46 per cent of the soil samples showed low to medium in phosphorus, 27 per cent low to medium in potassium.

The remaining percentages of samples from both categories were high and very high in P and K.

It is probably safe to assume that this low potassium level in the soils from greens is due to the frequent removal of clippings which contain much plant food, especially nitrogen and potassium. On fairways and lawns, where clippings are usually returned, the potassium in the clippings can be used again by the turf.

The very high phosphate level in greens can be explained by the fact that turf grasses remove only about ½ to ⅓ as much phosphate as potash. In addition, phosphorus is held tightly in the soil by complex chemical reactions and very little is lost through leaching. This combination of factors causes the phosphorus and potassium levels of soils from greens to differ greatly from other turf soils.

Since phosphate tends to accumulate in soils under heavy fertilization and large quantities of potash are removed in grass clippings, fertilizer for maintenance of greens should contain more potash than phosphate, in most cases. Generally speaking, fertilizer supplying twice as much potash as phosphate would be satisfactory.

Nitrogen Very Important

More nitrogen than any other major plant food element is required to grow turf grasses successfully. This is due to the fact (1) that nitrogen is easily leached from the soil, (2) that turf grasses often contain as much nitrogen as phosphate and potash combined.

Since nitrogen is required in large amounts for maintenance of turf grasses, fertilizers containing more nitrogen than phosphate or potash are usually recom-

Dr. James R. Miller is Extension Soils Specialist at the University of Maryland and head of the state-wide soil testing laboratory. Before joining Maryland, he was soil scientist with USDA at Beltsville. He has done research on radioactive fallout in soils and methods for determining available phosphorus in soils. He earned his B.S., M.S., and Ph.D. at Maryland.

Helpful Handbook

Forage

Fertilization

Pays

Order on Back Cover

mended. A 2-1-1 ratio of fertilizer (10-5-5, 12-6-6, 16-8-8, or 20-10-10) can meet the maintenance needs of lawns in many cases. But it is best to have the soil tested—to determine the specific fertilizer and lime needs.

In Summary

Due to vast changes in soil and climatic conditions, it is impossible to give specific lime and fertilizer recommendations for turf grasses over a large section of the country. However, the following general recommendations can be made.

1 Turf soils should be limed to about pH 6.5.

2 For establishing turf grasses, use fertilizers having a nitrogen (N), phosphate (P_2O_5), potash (K_2O) ratio of 1-2-2 or 1-1-1. Examples of these fertilizers are 5-10-10, 6-12-12, 8-16-16, 10-20-20, 10-10-10, 12-12-12, 13-13-13 and 15-15-15.

3 Most turf grasses for lawns can be maintained satisfactorily with a 2-1-1 ratio of fertilizer (10-5-5, 12-6-6, 14-7-7, 16-8-8, 20-10-10).

4 On turf areas such as greens, where the clippings are removed, it is desirable to supply plant food in the ratio of 4 pounds of nitrogen (N) to 1 pound of phosphate (P_2O_5) to 2 pounds of potash (K_2O).

THE END

Continued from page 3 (Western Turfletter)

arates." Then, the combination and mixture of these size ranges in the soil is referred to as "soil texture." This is one of the "physical properties" of soils.

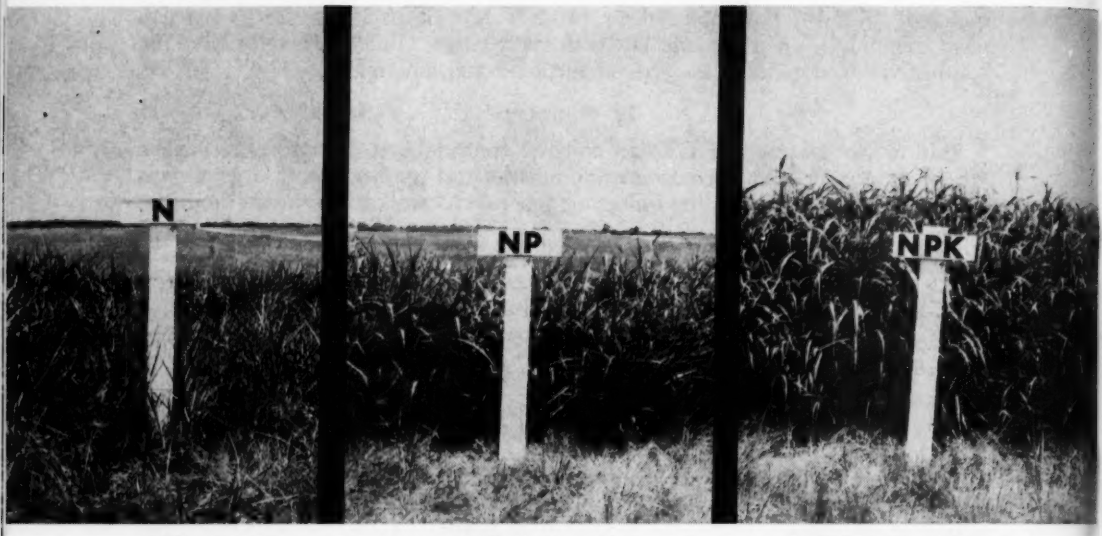
Another physical property is the arrangement of the particles into clusters or aggregates. This is "soil structure." Structure can be changed as a result of time and management, or both, and it plays a tremendous role in root development. Perhaps the breakdown of good soil structure in putting greens is one of the basic problems facing the modern golf course superintendent. Soil structure breaks down under compaction and irrigation; bent rooting depth becomes limited and *Poa annua* takes over. This is a familiar story to all.

Soil structure is considered good when the sand, silt and clay particles are associated into aggregates and clusters which are relatively water stable (i.e. will not easily disintegrate when wet). Good management practices and a soil mixture that will resist compaction (and drain readily) will greatly contribute to easing the "soil structure" problem for the superintendent. The "new" soil mixtures for putting greens will fulfill this requirement.

"Soil porosity" (pore space) is yet another physical property of soils. It is hard to believe (but true) that clays tend to have higher total porosities than sands. Although the clay pores are relatively small, they contribute to high water holding capacities, slow infiltration rates and, in many cases, poor aeration. Thus sands have larger pore spaces (but fewer pores per unit volume) and contribute to a more open structured soil with better aeration, more rapid infiltration and better internal drainage.

We have only "touched on soils." No one has all of the answers but research has taken us a step further toward better soils for putting greens. The saying "When you're through learning, you are really through" well applies. Will you "Pass" or be "By-Passed" in the coming years when it comes to talking soils?

—Western Turfletter



4,078 Lbs. Hay **8,803 Lbs. Hay** **25,300 Lbs. Hay**

The need for a *complete* fertilizer treatment became striking as the Johnsongrass demonstration progressed. As Dr. C. Dale Hoover observed, "The stand . . . deteriorated when phosphorus or potassium was omitted."

Johnsongrass—

A REAL HAY-MAKER

By E. H. Bailey
Starkville, Miss.

IT WOULD well pay beef and dairy farmers of the black prairie area of Mississippi to wake up to the great possibilities in Johnsongrass hay.

Six years of fertilizer demonstrations, conducted by Mississippi State University specialists, have shown that this forage (when properly fertilized, cut and cured) will average 10 tons per acre of hay that is second to alfalfa in feeding value and worth $300 per acre at 1960 hay prices—all with a bonus of "no re-seeding necessary."

In Mississippi State experiments, Dr. J. T. Miles early showed how well-fertilized Johnsongrass hay approaches alfalfa in feeding value when it is cut in the right stage of growth and properly cured. Table 1 gives the proof.

During the first 6 years of these Johnsongrass demonstrations, consisting of a general field plot and a special half-acre plot, the American Potash Institute has been privileged to cooperate closely with the Mississippi Experiment Station, headed by Dr. C. Dale Hoover of the Agronomy Department, and the Extension Agronomy Department, headed by W. R. Thompson, in searching for more facts about Johnsongrass hay production.

Above left—Profit talk by Agronomy Extension Leader W. R. Thompson and farmer S. P. Lenoir. When fertilization can mean an extra 9 tons hay per acre at 1960 prices of $30 per ton, the annual increase means $270 per acre.

Above Right—Wild winter peas make high yields of good forage when grown on good soils or when well fertilized.

. . . although considered a stubborn weed by farmers in some areas, 6 years of fertilizer demonstrations have proved it a top hay crop in the Black Prairie Belt of Mississippi.

In fact, the program was initiated by Ivan Miles and the author in 1954-55. And although it has not answered all the questions, by any means, the facts secured so far give some important leads on fertilizer response, hay yields, and other problems.

General Field Plot Results

In October, 1956, early results from the general field demonstrations on the S. P. Lenoir farm near West Point, Mississippi, were reported in this magazine by Dr Thomas Tucker, *including some 36,000 lbs. of green forage from a single cutting.* With this remarkable yield, Dr. Tucker raised the questions: "What about the potential of Johnsongrass for silage? What would it be for three to five cuttings?"

One year later, Dr. Hoover gave a further report on the Johnsongrass work on the Lenoir farm, urging his Better Crops readers to "give Johnsongrass a break . . . fertilize it."

Table 2 clearly shows why Dr. Hoover was urging fertilizer for Johnsongrass. Note how the complete fertilizer treatment, NPK, produced a hay yield of *some 12 tons per acre.* Commenting on this, Dr. Hoover said,

TABLE 1. COMPARATIVE FEEDING VALUES OF TWO LEGUME AND TWO GRASS HAYS

Hay[1]	Chemical analysis: Crude fiber	Crude protein	Cellulose	Gross energy	DM consumed daily	Refusal[2]	Digestion coefficients: DM	CP	Cell.	Energy
	(%) (Dry basis)			K Cal per gm.	per 100 lbs. body wt.		(%)			
Alfalfa	25.4	20.5	27.5	4.50	1.97	10	58.8	73.1	53.2	59.4
Soybean	37.3	11.8	37.8	4.22	1.43	50	57.3	68.1	54.7	57.7
Oat	36.0	8.4	38.8	4.29	1.66	27	64.6	57.3	71.8	61.3
Johnsongrass	33.3	13.3	36.1	4.59	1.72	26	64.4	67.3	73.4	63.2

[1] Third cutting alfalfa 1/10 bloom, soybeans cut in full bloom, oat hay cut in late bloom, high fertility Johnsongrass cut in early boot.

[2] This represents the amount of coarse stems that were refused when the animals were fed for maximum consumption. The 10% alfalfa refused was no different from the hay consumed. The extra was fed to insure maximum intake.

"These yields indicate a striking need for all three elements—nitrogen, phosphorus, and potassium. Nitrogen alone gave a yield of 4,078 lbs.; nitrogen and phosphorus 8,803 lbs.; nitrogen and potassium 8,678 lbs.; and, all three working together, a yield of 25,300 lbs. dry hay per acre."

After Tucker's earlier report on the heavy plant food removal by over 12 tons of Johnsongrass hay—890 lbs. N, 191 lbs. P_2O_5, 631 lbs. K_2O—Dr. Hoover concluded, "Such high rates of plant food removal in harvested hay would require annual or semi-annual additions of a complete fertilizer at a high rate with a possible need for small quantities of minor elements."

The Mississippi agronomist then added this significant fact, "The stand of Johnsongrass was maintained by a complete fertilizer, while the stand deteriorated when phosphorus or potassium was omitted." Table 3 shows what he meant.

Wild Winter Peas—Pro & Con

The plot area reported by Dr. Hoover was seeded to wild winter peas in the fall of 1956 to be observed for two or three years with no additional fertilizer other than residual from Johnsongrass applications. The weights of green forage from the peas, taken in the spring of 1957 when they were in the blooming stage, show some interesting differences in Table 4.

In addition to pounds of green

TABLE 2. RESULTS OF VARIOUS TREATMENTS ON JOHNSONGRASS HAY YIELDS SHOW STRIKING NEED FOR A COMPLETE FERTILIZER

(On a Black Prairie Soil, S. P. Lenoir Farm, West Point, Miss.)

Treatment in lbs./A.			Cutting in pounds green wt./A				Dry Hay lbs./A
N	P_2O_5	K_2O	First	Second	Third	Total	
0	0	0	1936	1815	605	4356	1501
400	0	0	5445	3025	1210	9680	4078
400	400	0	10769	10890	2420	24079	8803
400	0	400	8591	9075	3327	20993	8678
400	400	400	21296	33880	6050	61226	25300

forage, other major differences in the various treatments seemed to be this at the time weights were made:

1 NPK Plot. Very heavy and flowering stage, with plants dropping (lodging) and decaying beneath the mass, causing less weight than expected. The plants should have been grazed earlier or removed for hay or silage. Practically no Johnsongrass coming through heavy growth of peas.

2 NP Plot. Had weak pea stems and some lodging. Practically no Johnsongrass coming through heavy growth.

3 NK Plot. Showed strong peas that stood up well, with little or no decaying. Johnsongrass coming through fairly well.

4 N Plot. Showed smaller peas that were erect, with no lodging or decaying beneath. Johnsongrass coming through fairly well. Pea behavior on this plot somewhat puzzling when compared with Johnsongrass yield and behavior on same plot. There were indications that winter peas absorb phosphate and potash very efficiently.

5 Check Plot. Showed few peas —and those were small and starved-looking, as expected.

Some general conclusions seem to be: (1) That lodging peas create a cover that cuts off light supply needed by grass, (2) that Johnsongrass can eventually come through on all plots as the peas produce seed and decay. (3) but that heavy growth of peas can retard or reduce grass stand enough to reduce yields.

The decrease in Johnsongrass yield could be justified *if* wild winter peas could be utilized by grazing, or as silage or hay, or combined for seed as many farmers do. In any case, good management with proper fertilizer usage is demanded.

Special Half-Acre Plot Results

A half-acre Johnsongrass fertilizer demonstration, begun in 1955 and still underway, will be continued indefinitely. During the first two years, 320 lbs. of 6-24-24 per acre was applied, with 66 lbs. of N per acre topdressed for each crop of hay. But when nutrient deficiencies appeared, the rate was changed in 1957 to 640 lbs. of 6-24-24, with 66 to 120 lbs. of N per acre for at least two hay cuttings each season.

Nitrogen topdressings varied some each season, depending on rain prospects and other factors. As a rule, the second hay crop, usually grown under optimum weather conditions, received 120 lbs. N and the third crop 66 lbs. N. When weather conditions favored a bumper crop, as in 1960, 120 lbs. N per acre was applied twice.

Due to weather and other factors beyond control, no yield records were taken on the half-acre demonstration during 1955 and 1959, leaving the records to include 1956, 1957, 1958, and 1960.

In the early days of the demonstrations, an extra application of muriate of potash on a strip in the field caused

TABLE 3. ESTIMATED PERCENTAGE OF JOHNSONGRASS IN THE FIRST CLIPPING (LENOIR FARM MAY 24, 1956).

	Per cent	
Treatment*	Johnsongrass	Other
N	50	50 weeds
NK	75	25 weeds
NP	2	98 Cheat
NPK	99	1 weeds

* Rate same as shown in Table 1.

TABLE 4. WILD WINTER PEAS

Fertilizer Treatment	Pounds of Green Forage in Pounds per Acre
NPK	22,022
NP	10,285
NK	13,794
N	10,527
Check—No Fertilizer	4,840

Rates of Application: 400 N, 400 P, and 400 K.

TABLE 5. HOW EXTRA APPLICATION OF POTASH CAUSED SHARP INCREASE IN HAY YIELD

Name of Farmer	Treatment	Cuttings			Total Lbs. Green Wt.	Dry Hay Lbs.
		First	Second	Third		
S. P. Lenoir	N	5,445	3,025	1,210	9,680	4,078
NPK Plots	NK	8,591	9,075	3,327	20,993	8,678
High Rates	NP	10,769	10,890	2,420	24,079	8,803
	NPK	21,296	33,880	6,050	61,226	25,300
I	No Fert.	1,936	1,815	605	4,356	1,501
S. P. Lenoir Original ½ Acre Demonstration II	(1) 6-24-24 @ 320# plus 66# N on each crop	12,603	21,780	3,025	37,410	15,588
	(2) Same plus 400# muriate of potash	12,605	Applied after first cutting 36,300	4,325	53,140	20,670
	(3) No Fert.	1,936	1,815	605	4,356	1,501
Eugene Sikes III	(1) 6-24-24 @ 400# plus 66# N on each crop		First cutting made July 7 35,890	5,445	40,535	14,761
	(2) No Fert.		7,260	907	8,167	2,963

Demonstration number I was inaugurated in the spring of 1955 after number II, the original ½ acre demonstration, showed a very unusual response to fertilizer applications. The rate of application is approximately 400# N, 400# P, and 400# K. After two years of treatment with the high rates of application, the soil on the complete fertilizer plots show a good reserve of both P and K. The pH of the soil is about 7.

such an *increase* in hay yield that the rate of the complete fertilizer was increased. *This substantial increase from potash is shown in Table 5.*

The annual application of the 6-24-24 fertilizer, together with two or three applications of nitrogen, resulted in an average increase of more than 10½ tons hay per acre for the 4 years on which records were kept. This record is shown in Table 6.

Since hay production for the two no-record years was just as good as the other years, it is safe to say the

TABLE 6. ANNUAL FERTILIZER TREATMENT INCREASED JOHNSONGRASS HAY YIELD AN AVERAGE OF 10 TONS PER ACRE—ON BROOKSVILLE CLAY SOIL

Crop Year	Treatment as Described	Yield in Pounds Dry Hay Per Acre
1956	Fertilized Area	15,888
	Check No Fertilizer	1,501
1957	Fertilized Area	22,990
	Check No Fertilizer	3,025
1958	Fertilized Area	23,021
	Check No Fertilizer	2,127
1960	Fertilized Area	25,140
	Check No Fertilizer	3,213
Average Yield Fertilized		21,759 Pounds Hay
Check No Fertilizer		2,466 Pounds Hay

demonstration averaged 10 tons of hay per acre per year for the 6-year period.

This demonstration shows how proper fertilizer treatment *increased* hay production more than 9 tons per acre per year. Figured at 1960 hay prices of $30.00 per ton for Johnsongrass hay, this annual increase would amount to $270.00 per acre.

What other crop in the prairie will make this much money per acre?

Wild Winter Peas—Pro & Con

In the spring of 1957, a record was kept on the yield of green forage produced from wild winter peas planted the previous fall on the east half of the half-acre Johnsongrass demonstration. The weights of green forage showed:

Fertilized area: 18,755 lbs. per acre
No fertilizer: 4,840 lbs. per acre

In the spring of 1960, the peas were cut on the same plots and the forage cured for 3 weeks. The weights of dry hay showed this:

Fertilized area: 11,475 lbs. per acre
No fertilizer: 2,295 lbs. per acre

The peas made very heavy growth. The hay produced is heavy even after it is well-cured. There was a noticeable absence of weeds on the area that had been fertilized and hayed for 6 years.

When the peas were allowed to make seed and decay on the soil in 1957, the first cutting of hay was not made until July 12, the second on September 2. The following record of the two clippings showed why it is necessary to practice careful management when peas and Johnsongrass are grown together:

July 12

1. Legume area east	**8,470 pounds hay**
2. Regular fertilizer west No legume	**12,705 pounds hay**

Sept 2

1. Legume area east	**11,495 pounds hay**
2. Regular fertilizer west No legume	**10,285 pounds hay**

On the legume end of the demonstration, note how (1) in the first cutting the legume retarded the Johnsongrass and reduced yields, (2) in the second cutting the grass did not have the competition and produced the highest yield.

Management Tips—Peas

If the peas are used and managed properly, they can be very profitable —if not, they can reduce hay yields sharply. Since such management determines whether winter peas are profitable or a losing venture with Johnsongrass, some management tips are worth noting here:

1 No nitrogen seems necessary for the first crop of grass following peas, whether cut at blooming or left to produce seed and decay.

2 The peas can be used for silage or hay, or for grazing and combining for seed.

3 The peas are good producers of seed that can make a good cash crop in addition to the hay.

4 Growing peas requires an annual application of phosphate and potash plus one or two applications of nitrogen.

But whether grown with peas or without them, a good Johnsongrass meadow can be maintained indefinitely with regular applications of complete fertilizer combined with good management.

Management Tips—Grass

The 6 years of demonstrations have taught us some lessons:

1 The higher the hay yields, the higher the phosphate and potash rates should be. It should be remembered that Johnsongrass hay removes from the soil *three times more potash* than phosphate.

2 Plowing apparently is not necessary where there is already a stand of grass. The demonstrations reported here were conducted on old John-

Continued on page 29

Crop	Acreage	Management Levels Present	Management Levels Improved	Logan County
Corn	43,000	$245,960	$ 999,720	←
Alfalfa	4,000	6,320	72,720	
Pasture	102,186	326,995	3,494,760	
Totals	149,186	$579,275	$4,567,200	Calculated Net Income Potentials
	Net Increase	$3,987,925		

MUCH MORE LIME AND FERTILIZER NEEDED

By B. N. Driskell
University of Kentucky

SOIL testing has helped guide the liming and fertilization program of thousands of farmers, as well as help determine limiting factors in crop production.

Kentucky Agricultural Experiment Station test results have shown that considerable increases in crop yields could be expected by following recommendations according to soil tests and good management.

One County's Potential

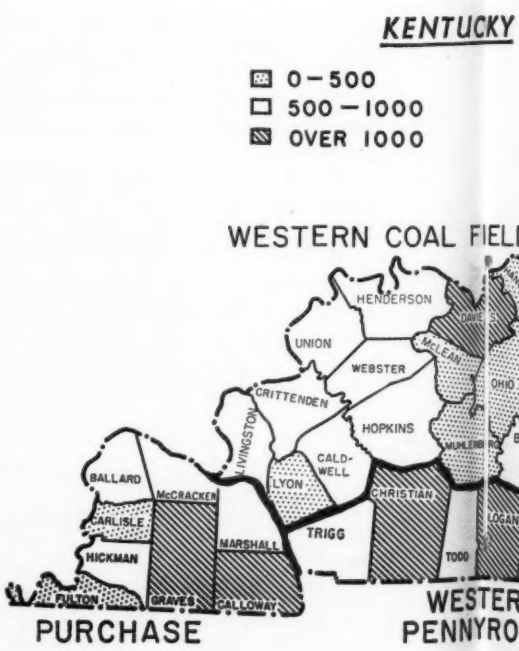
Look at the present potentials for just one representative Kentucky county (Logan) shown above.

These calculations assume production costs and selling prices at approximately present levels. The Logan county potential is about average for western Kentucky counties. Although this exceeds expectation for most eastern Kentucky (mountain region) counties, much progress could be made in the mountain area by following the Experiment Station's fertilization and management recommendations.

Excellent potentials exist in all parts of Kentucky on practically all soils and crops. In fact, Kentucky's present net income is only about one-seventh the potential (or what it could be) with proper fertilization and management.

Soil Regions

Kentucky can be divided into six broad soil regions: Purchase, Western Coal Fields, Western Pennyroyal, Eastern Pennyroyal, Blue Grass, and Mountains. (Figure 1).



Calculated Crop Removal And Nutrients Added

	Tons of Plant Nutrients		
	P_2O_5	K_2O	Ca+Mg.
Crop removal	**84,000**	**234,000**	**122,000**
Additions as commercial sources	**71,000**	**69,000**	**119,000**
Net deficit	**13,000**	**165,000**	**3,000**

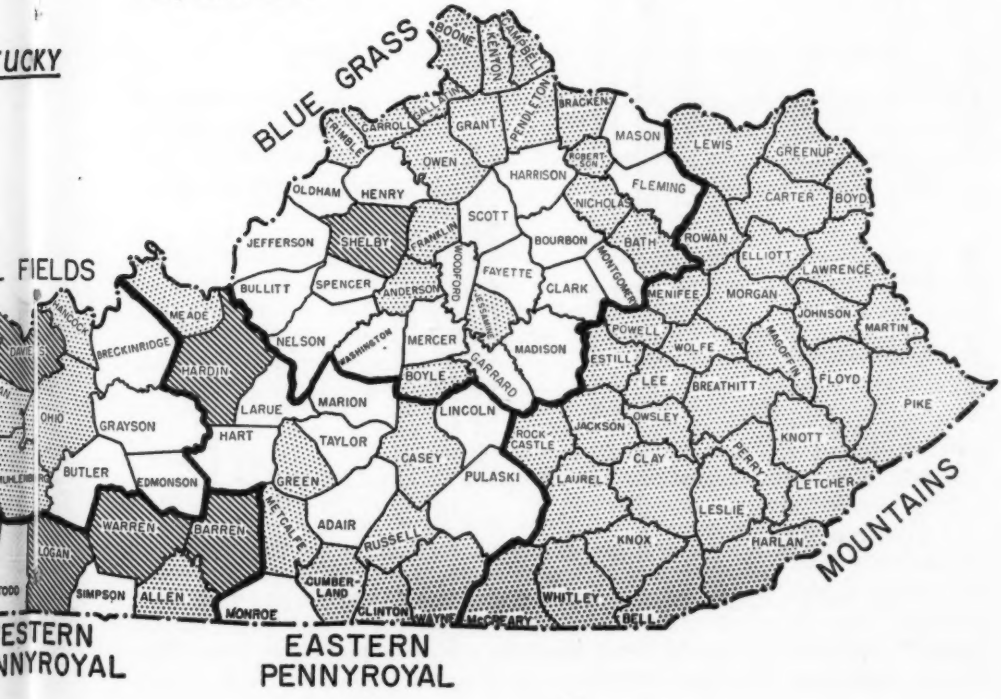
1960

SOIL TESTS SHOW

The Western Pennyroyal soils, from limestone and loess residuum, generally show higher pH values than soils of other regions. Soils of the Blue Grass region generally contain much more native phosphate than other regions. Although not intensively cultivated, the Blue Grass region has more total land area in farms than other regions.

Expected responses to lime, phos-

Figure 1—More than 58,500 soil samples were tested in Kentucky last year (1960). This map shows the four major soil regions and number of samples tested by county. Graves County led with 1,758 samples, Christian County with 1,744, and Logan with 1,510 samples. The western counties generally tested more samples per county and more samples per thousand acres than any other area.



phorus, and potassium, as calculated from the 1960 soil test reports, are shown below.

Percentage of Soils Expected to Give Response

Region	Lime %	Phosphorus %	Potassium %
Purchase	84	66	71
W. Coal Fields	79	67	72
W. Pennyroyal	63	57	53
E. Pennroyal	76	62	58
Blue Grass	74	27	50
Mountains	77	55	56
Kentucky	75	52	59

Although a good portion of these soils indicates possible response from lime, phosphorus, and potassium, a need for more soil testing is due to the large fertility variation between different fields of the same area. For example, in the Blue Grass region of high phosphate, some of the soils show low phosphate and good response.

Lime is possibly the number one need of most Kentucky soils, especially because it is the foundation on which other needed nutrients are added.

Approximately equal tons of P_2O_5 and K_2O are sold in the state. The need for these two elements is about equal except in the Blue Grass region.

Acidity Increase, 1956-1960

The trend toward higher acidity during these five years should arouse much concern in Kentucky. Figure 2 clearly shows how the soils being

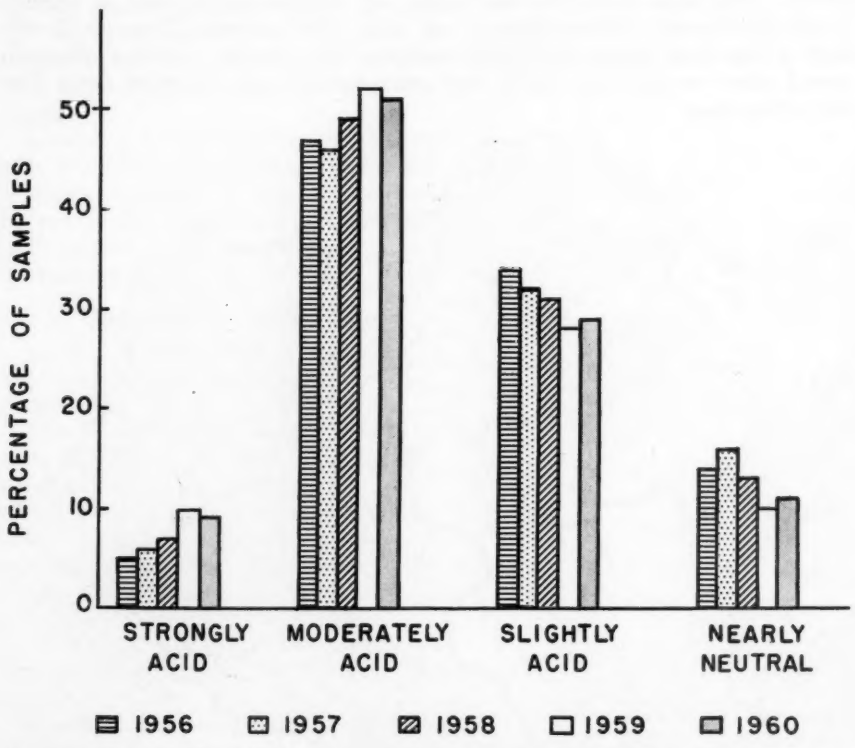


Figure 2—Soil acidity is on the rise in Kentucky. Soil samples taken from 1956 through 1960 show this steady increase.

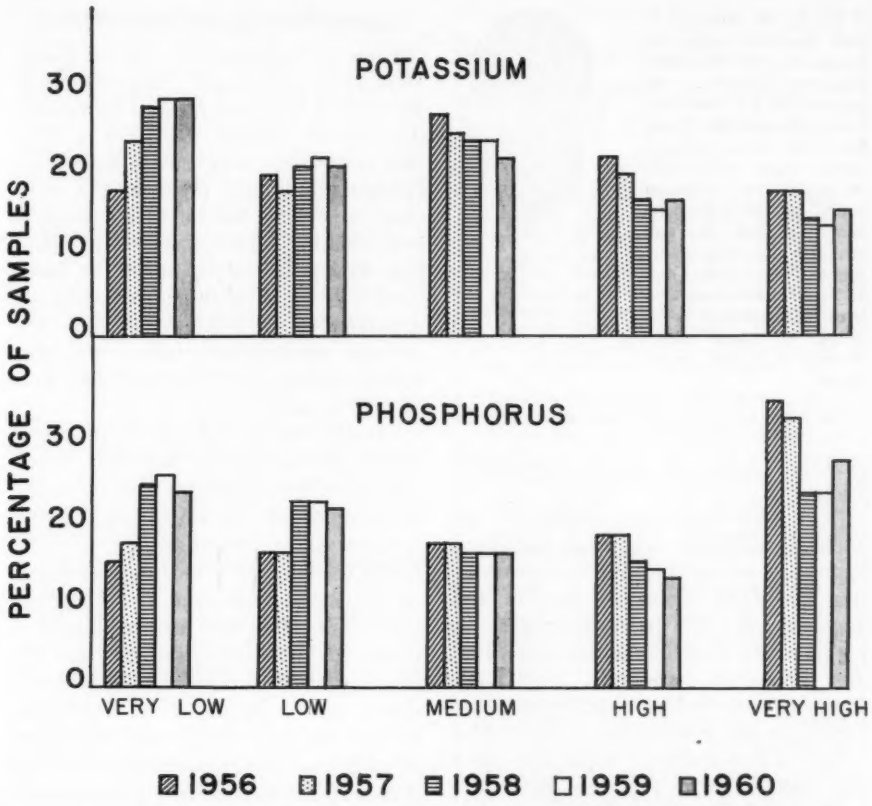


Figure 3—The level of available phosphorus and potassium in Kentucky soils is apparently declining, soil test summaries show. The percentages of soils testing *very low* and *low* in P and K over a 5-year period (1956-60) have revealed the increasing trend shown here.

tested increased in acidity with time.

Kentucky is now liming only about one acre out of each eighteen acres needing it. The liming practice is difficult to sell to farmers because the response may not always be immediately evident.

Low Phosphorus and Potassium

Although the trend shown in Figure 3 seems irregular, there appears to be a gradual trend toward very low and low phosporus and potassium. The 1960 soil test averages are likely higher than actually exist because the proportion of samples from the Blue Grass region, where soils are generally higher in P and K than elsewhere, increased while samples from other areas declined.

Fertility Trends Explained

A number of theories may explain why Kentucky soil fertility trends are toward higher acidity and lower phosphorus and potassium. The most convincing one, perhaps, is the fact that more of these nutrients are being harvested (removed) from the soil by crop removal than are being returned to the soil by present applications. This is shown by the table on page 25 which includes calculated estimates of 11,-

Dr. B. N. Driskell is Soils Specialist with the University of Kentucky Extension Service. He earned his B.S. and M.S. from Mississippi State, his Ph.D. from Pennsylvania State University. In addition to Extension work at Kentucky, he has done teaching and research at Mississippi State, Penn. State, and L. S. U. Author of several publications, his work in plant tissue testing is widely recognized.

537,000 acres of major agronomic crops.

Although these calculations do not include nutrients added as barnyard manures, any additions from manures are not likely to exceed fixation and leaching of the various nutrients.

Since the present data do not cover the proportion of samples from long-time tobacco fields or poorer pasture lands, it is impossible to determine what influence these factors may have on the trends.

The increase in acidity may partly be due to the use of larger quantities of nitrogen and higher crop yields. Also, in certain sections many of the poorer soils went into the Conservation Reserve program. In areas of little participation in the Conservation Reserve program, this trend to acidity was not as evident.

Suggestions on Nutrient Needs

Lime is deficient on approximately 75 percent of the soils. Approximately 15 million tons are needed to correct the present acidity. In 1959, 1,367,000 tons of lime was used in Kentucky. Present application rates are not sufficient to supply the losses by removal and leaching. Increased use of nitrogen increases the demand for more lime. *The use of nitrogen could be expanded to at least three times the present consumption with good economic returns.* In 1958-59, 45,000 tons of N was used.

Phosphorus is deficient on approximately 50 percent of the soils, while potassium is deficient on approximately 60 percent of the soils. *More than four times the present tonnage of these fertilizers—P and K—could be used to an economic advantage in Kentucky.*

Farmers who use soil testing as a guide for fertilizer practices are the more successful farmers. Evidence shows this. In particular instances, certain farmers have found advantage in applying larger amounts than the state experiment station recommends. But the large mass of farmers need to get up to present recommendations.

Present farm income in Kentucky could be increased by many millions of dollars if soil testing recommendations and recommended management practices were followed more widely.

THE END

Put on Colorful Meetings

With Color Slide Sets on Fertilizer Placement, Soybean Production, Alfalfa Management, and Potash Hunger Signs

Easy Ordering on Page 36

Continued from page 23

songrass meadows that had a fair stand of starved grass and were covered with wire grass. The fertilizer was simply applied on the soil surface from year to year, with only light discing to cover the wild winter peas when they were added.

3 Farmers who have lost their stand of grass completely by cutting hay on their meadows from year to year without fertilizing can regain their stand by (1) plowing the land and discing or harrowing it until the surface is smooth as for wheat or oats, (2) working the phosphate and potash into the surface soil before final harrowing or cultipacking, (3) drilling or broadcasting and harrowing the seed in.

4 The time to seed Johnsongrass is late fall.

5 Some Johnsongrass meadows need lime from time to time, depending on the soil pH best revealed by a soil test.

6 Nitrogen should be applied just before the time it is needed for boosting growth, while phosphate and potash can be applied any time convenient to the farmer.

7 The last crop of Johnsongrass, produced in late August or early September, should not be cut or removed from the field, since it is needed to build up food reserves for the underground stems. If grazed, at all, it should not be touched until well after the first frost. Many meadows succumb to winter because they are overused. Johnsongrass needs a good food reserve in its roots just as alfalfa does in its crowns and roots.

8 Weather conditions and stage of growth are important factors in successful cutting. The grass should be cut before it reaches the booting stage when the leaves are green and nutritious. Cut at this stage and conditioned with a hay conditioner, it can be cured in half the time with the best quality insured. **THE END**

For Reliable Soil Testing Apparatus there is no substitute for LaMOTTE

LaMotte Soil Testing Service is the direct result of 30 years of extensive cooperative research. As a result, all LaMotte methods are approved procedures, field tested and checked for accuracy in actual plant studies. These methods are flexible and are capable of application to all types of soil, with proper interpretation to compensate for any special local soil conditions.

Time-Proven LaMotte Soil Testing Apparatus is available in single units or in combination sets for the following tests:

Ammonia Nitrogen	Iron
Nitrate Nitrogen	pH (acidity and alkalinity)
Nitrite Nitrogen	
Available Potash	Manganese
Available Phosphorus	Magnesium
Chlorides	Aluminum
Sulfates	Replaceable Calcium

Tests for Organic Matter and Nutrient Solutions (hydroculture) furnished only as separate units.

LaMotte Combination Soil Testing Outfit

Standard model for pH, Nitrate, Phosphorus and Potash. Complete with instructions.

Illustrated literature will be sent upon request without obligation.

LaMotte Chemical Products Co.

Dept. BC Chestertown, Md.

Some ABC's . . .

BASIC PRINCIPLES FOR A CORN FERTILIZATION PROGRAM—

Mixed Fertilizers (In the row)

The Stimulators. Do Effective Work As Plant Starters. Best Carriers of Phosphorus.
Usually pay good profits; but, pay best where nutrients are nearly adequate. When a giant is needed, mixed starters only do a boy's job. Generally do not add enough N and K for greatest profit.
USE: 100 to 300 lbs. per acre. See note No. 1.

Bulk Plant Foods—Broadcast
For full feeding and soil conservation to do the big job, guide by these principles:

Nitrogen

Feed the Microbes and Plants for Vegetation and Root Growth—To Make Cellulose and Protein.
Plants need steady supply to end of season. Big peak of nitrates not good. All forms change to nitrates. All forms have their own advantages.

How To Use:

1 Deep—Broadcast and plow under with organic residues for slow release. *Use:* 50 to 100 lbs. N. per acre.

. . . For Corn

American Farm Research Association

West Lafayette Indiana

—As Interpreted by George D. Scarseth

2 Row—Just enough to off-set cool, wet soils. *Use:* 5-15 lbs. N. per acre in a starter mixture.

3 Sidedress—For late feeding and to avoid excess nitrates at silking time. Apply in middles—0 to 30 days after planting. *USE:* 50 to 100 lbs. N. per acre. Omit in excessively dry seasons.

Phosphorus

Feed the Baby Plant for Embryo Development and for Big Stalks and Strong Roots.
The Key Element in all Starters. Favor use in the Row. Needed near roots (not in contact) and deep enough to be in moist soil. Roots must grow to phosphorus because no phosphorus moves much in any soil. Heavy soils lock up phosphorus. Highest availability near pH 6.5. Partial ammoniation of phosphorus gives high water solubility and quick uptake. Don't need over 40-50 percent water solubility. Other processed forms are also water soluble and available in different degrees. Rock phosphates usually low in availability. *USE:* 50-100 lbs. availa-

ble P_2O_5 per acre. When using over 50 lbs. P_2O_5 per acre, plow under ½.

Feed the Plant for Health and Quality—The Sugar Maker.
Mix the Giant amount throughout the soil with broadcasting and plowing under; apply any convenient time; let the plant feed from the absorbing soil complex and avoid salt effects. Balance the cousins, Calcium, Magnesium and Potassium by "Potashing" the soil with low cost potassium material, usually potassium chloride.

Potassium

Calcium and Magnesium are added cheaply by *liming with dolomitic limestone*—why not add potassium the same way? Will not leach on heavy soils. When using more than 40 pounds per acre in a row starter mixture, plow under 60-200 pounds K_2O per acre.

1 Do not place any starter fertilizer in contact with the seed. Throw away the old split-boot applicator. Use a modern disk side-applicator, which places the fertilizer about 2 inches to one side of the seed and scatters it in a vertical band over a depth of 1 to 5 inches.

2 Be on the outlook for the need of trace elements. When needed buy only guaranteed amounts.

3 More profits are missed by under-fertilizing than over-fertilizing. To be under the need is more expensive than to be over.

Notes

4 Watch your fertility levels by checking with soil and tissue tests. Don't forget to lime when needed.

5 A poor stand can cost you 10 to 20 percent or more from loss in yields and will cut out the profit.

6 In a dry year, all is not lost because the residuals are valuable and may carry over to make a profit the next year.

7 On flat, heavy land about ½ of the nitrogen and phosphorus and most of the potassium may be broadcast and plowed under in the fall—spreads the labor load, avoids spring delays and heavy trucks or machines on wet soils; also saves money and allows your dealer to render a better fertilizer service.

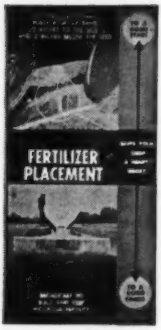
THE END

(CUT ON DOTTED LINE—YOUR MAGAZINE WILL NOT BE HARMED—SEE REVERSE SIDE FOR OTHER MATERIALS)

COLOR FOLDERS FOR YOU TO DISTRIBUTE AND USE IN TEACHING • AT MEETINGS • FOR EXHIBITS

FOLDER C-59

Do you want to prevent hidden hunger in crops? If so, this folder will acquaint you with that all-important hidden hunger zone on the yield curve and how to deal with it. It points out how crops often do not show definite deficiency symptoms but still need extra plant food.



FOLDER E-59

Here are graphic pointers on safe, efficient fertilizer placement. How to avoid injury to seedlings. How to use nutrients efficiently from start to finish. How *right* placement pays on specific crops. How to get the right start, to build fertility, to maintain it, etc.

Quantities above free policy (stated below) only $1 per 100, $10 per 1000

FOLDER B-59

Here is shown the role of potash on yield and quality. How much potash certain basic crops take from the soil in a year. How heavy nitrogen treatment can cause crops to use up available potash *fast*. How potash affects quantity, quality, drought and disease resistance.

FOLDER D-59

This folder capsules plant food corn absorbs during different periods of its 4-month growing season—the minerals used by corn producing 100 bushels per acre. It shows what corn ears look like when they suffer from shortages of nitrogen, phosphate, and potash.

Department B. C.,
American Potash Institute,
1102 16th St., N. W.,
Washington 6, D. C.

DISTRIBUTION POLICY FOR EACH FOLDER

to Official Agricultural Advisors:

Up to *500* Copies Free
Quantities Above 500 Copies at Cost:
$1 per 100; $10 per 1000.

To Commercial Representatives:

Up to *100* Copies Free
Quantities Above 100 Copies at Cost:
$1 per 100; $10 per 1000.

Name_____

Organization_____
(AGRICULTURAL CONNECTION)

Address_____

City_____

State_____

Signed_____

Please Send Folders

Folder	Number Desired
D-59	_____
E-59	_____
B-59	_____
C-59	_____

For quantities above stated free policy:

$_____ **attached**

Bill me $_____

(CUT ON DOTTED LINE—YOUR MAGAZINE WILL NOT BE HARMED—SEE REVERSE SIDE FOR OTHER MATERIALS)

FREE REPRINTS

ON SOILS AND CROPS AS LONG AS SUPPLIES LAST

	Serial Number	Number Desired
Starved Plants Show Their Hunger	GG-10-48	
Efficient Vegetable Production Calls for Soil Improvement	CC-8-49	
Balanced Nutrition Improves Winter Wheat Root Survival	J-3-53	
Coastal Bermuda—A Triple Threat Grass on the Cattleman's Team	N-4-53	
Strong Roots Make High Corn Yields	AA-8-53	
White Birch Helps Restore Potash-deficient Forest Soils	MM-12-53	
So You Want to Grow Alfalfa	S-4-54	
Potash Pays on Forage in New England	BB-6-54	
Longer Life for Ladino	MM-10-54	
Seven Steps to Good Cotton	G-2-55	
Give Your Plants A Blood Test	L-5-56	
Fertilizing Alfalfa in Kentucky	X-12-56	
Potash Fertilizers and Their Behavior	C-2-57	
Growing Azaleas and Camellias	N-5-57	
Soil Tests Spotlight Turf Needs	P-8-57	
Pedagogues of the Plow	T-8-57	
Fall Fertilizing Pays Off	U-10-57	
Key to Long Life Ladino	BB-11-57	
How to Use Fertilizers Profitably	CC-11-57	
Takes Good Production Practices to be Top Tomato Growers	DD-11-57	
Plant Food Utilization	EE-12-57	
Make Agronomy Your Career	A-1-58	
Potassium Content and Forage Yield As Affected by Fertilization	K-3-58	
Toward More Efficient Vegetable Fertilization	N-4-58	
High Nitrogen Increases Potash Needs of Grasses	DD-11-58	
Development of Potassium Use and Future Possibilities	11-12-58	
Principles for Roadside Fertilization	A-1-59	
Improve Grass Pastures by Growing Legumes	B-1-59	
Fertilizers Boost Bell Pepper	C-1-59	
Fertility Needs of Crimson Clover Grown With and Without Coastal Bermuda	G-8-59	
More "Know Why" Through Soil Fertility Records	M-10-59	
Know What's In Your Fertilizer Bag	Q-11-59	
Forage Crops Require High Fertility	T-12-59	
Growing Alfalfa Successfully	B-5-60	
Potassium in Row Fertilizer for Corn	A-3-61	
Coated Fertilizer in the Future	B-3-61	
Tailor-Made Recommendations	C-3-61	
Check Your Plant Food Deficit	D-3-61	
Top Wildlife Food . . . Low Upkeep Costs . . . Via Fertilizer Management of Utility Right-of-Way	E-6-61	

Name_____ City_____

Address_____ State_____

Department B.C. American Potash Institute 1102 16th St., N.W. Washington 6, D.C.

NEW MOVIE—WITH TWO SHORTS

IN COLOR AND SOUND

GROWING ALFALFA SUCCESSFULLY

16MM, 975 FEET, 25 MINUTES RUNNING TIME

Showing the value and uses of alfalfa . . . soil and nutrient requirements . . . cultural methods . . . latest management techniques . . . with special time-lapse photography to show how the plant feeds and grows.

THE TWO SHORTS BELOW ARE CONDENSED VERSIONS OF THE MASTER MOVIE ABOVE:

ALFALFA, QUEEN OF FORAGES

16MM, 368 FEET, 10 MINUTES RUNNING TIME

GOOD ALFALFA REQUIRES GOOD FERTILITY

16MM, 365 FEET, 10 MINUTES RUNNING TIME

ORDER COUPON BELOW

DEPT. B.C., AMERICAN POTASH INSTITUTE, 1102 16TH STREET WASHINGTON 6, D. C.

I would like to book the movie checked below for the date indicated:

	Date	Alternate
Growing Alfalfa Successfully 16mm 975 Ft. 25 Mins.	_____	_____
Alfalfa, Queen of Forages (Extract) 16mm 368 Ft. 10 Mins.	_____	_____
Good Alfalfa Requires Good Fertility (Extract) 16mm 365 Ft. 10 Mins.	_____	_____

Name _____ **Address** _____

Organization _____ **Signed** _____

See opposite side for color slides.

AMERICAN POTASH INSTITUTE (DEPT. BC)
1102 16TH STREET, N.W.
WASHINGTON 6, D.C.

PLEASE SEND ME YOUR SLIDE SET "POTASSIUM HUNGER SIGNS" FOR SHOWING ON THE DATE INDICATED BELOW.

FOR LOAN: TEN DAYS
FOR PURCHASE: $_____ ENCLOSED

DATE_____ ALTERNATE_____

NAME_____

ADDRESS_____

_____

AMERICAN POTASH INSTITUTE (DEPT. BC)
1102 16TH STREET, N.W.
WASHINGTON 6, D.C.

PLEASE SEND ME YOUR SLIDE SET "SOIL FERTILITY AND SOYBEANS" FOR SHOWING ON THE DATE INDICATED BELOW.

FOR LOAN: TEN DAYS
FOR PURCHASE: $_____ ENCLOSED

DATE_____ ALTERNATE_____

NAME_____

ADDRESS_____

_____

AMERICAN POTASH INSTITUTE (DEPT. BC)
1102 16TH STREET, N.W.
WASHINGTON 6, D.C.

PLEASE SEND ME YOUR SLIDE SET "SUCCESSFUL ALFALFA" FOR SHOWING ON THE DATE INDICATED BELOW.

FOR LOAN: TEN DAYS
FOR PURCHASE: $_____ ENCLOSED

DATE_____ ALTERNATE_____

NAME_____

ADDRESS_____

_____

AMERICAN POTASH INSTITUTE (DEPT. BC)
1102 16TH STREET, N.W.
WASHINGTON 6, D.C.

PLEASE SEND ME YOUR SLIDE SET "FERTILIZER PLACEMENT" FOR SHOWING ON THE DATE INDICATED BELOW.

FOR LOAN: TEN DAYS
FOR PURCHASE: $_____ ENCLOSED

DATE_____ ALTERNATE_____

NAME_____

ADDRESS_____

_____

ORDER SLIDE SETS

THIS EASY WAY

- **Potassium Hunger Signs ($2.20) 22 Slides and Script**

Shows typical potash hunger signs in field crops, vegetables, fruits, forage crops, and some ornamentals. Such common potash hunger signs as poor growth, leaf scorch, poor root development, weak and lodged plants, poor seed and fruit quality. Can supplement local slides.

- **Soil Fertility and Soybeans ($4.20) 42 Slides and Script**

Assembled in cooperation with the National Soybean Crop Improvement Council. Covers nutrition, including liming, direct fertilization, rotational fertilization, and placement, as well as other factors in production. Tells a rather complete story—and can readily supplement local slides.

- **Successful Alfalfa ($4.00) 40 Slides and Script**

Shows the value and use of alfalfa in modern farming. Gives 10 steps in successful production, including liming, fertilization, and management. While it tells a rather complete story, it is designed so you can use it to supplement local slides.

- **Safe, Efficient Fertilizer Placement ($4.00) 40 Slides and Script**

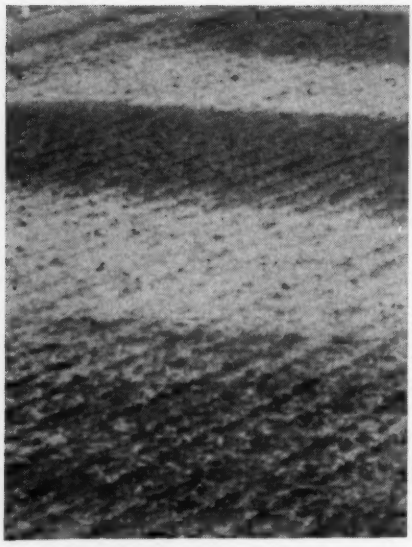
Illustrates proper placement methods on *row crops*, *forages*, and *small grain*—and what happens when fertilizer is wrongly placed. Shows how band placement pays, how band seeding improves legume and grass stands. With sharp color and vivid illustrations for classroom showings, meetings, short courses, etc. Can supplement local slides.

FUNK'S G HYBRID

It's what is *IN* the seed that counts!

THE PRODUCERS OF FUNK'S G-HYBRIDS

FUNK BROS. SEED CO. • BLOOMINGTON, ILLINOIS



A COLORIMETRIC QUICK-TEST

By Seton N. Edson

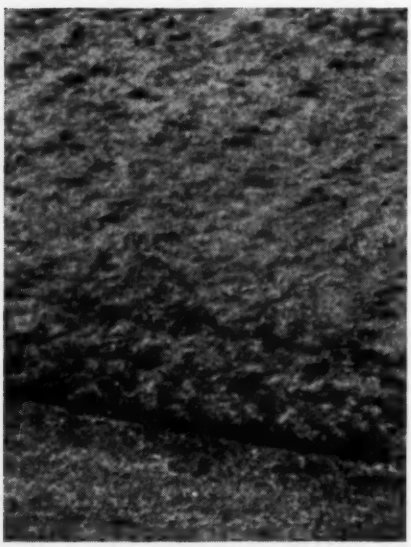
COLORIMETRIC methods for soil testing have grown more popular through the years. Why? Because they are accurate within the desired range, they are simple to conduct, and they are inexpensive to use.

Many attempts have been made to measure soil moisture without the use of the weighing and drying techniques. L. D. Baver mentioned one method of soil moisture testing that used pure alcohol to take up the moisture from the soil particles. The difference in alcohol concentration was then measured to determine the amount of soil moisture.

Baver also emphasized the importance of using a volume of soil rather than a given weight. This seems logical since the roots of plants obtain their moisture from the volume of soil in which they penetrate.

The colorimetric soil moisture test presented herein is based on a 5 cc volume of soil extracted with a quantity of pure alcohol.

It was decided that the classical moisture indicator, *cobalt chloride,* could be used with alcohol and water



to change into its characteristic purple and pink colors when in contact with moisture. This material has been used for years to spot test for moisture in plant materials and food stuffs, according to J. Pomeranz and C. Linder.

When moisture is extracted from the soil with pure alcohol, in the presence of a concentrated water solution of cobalt chloride, *only the amount of moisture present reacts with the test solution.* The cobalt chloride solution changes from a deep blue to purple and finally to a pink color as the full six molecules of water of crystallization are picked up. This color change is directly related to the amount of moisture present in the alcohol extract—the greater the color change, the greater the soil moisture.

TABLE 1 **PERMANENT COLOR REFERENCE STANDARDS

Ml of Alcohol Reagent	*Ml of Water	Color	Percent of Moisture	Approximate Field Capacity
10	0.00	Deep blue	None	Sands
10	0.20	Medium blue	4	Loamy sands
10	0.42	Light blue	8	
10	0.64	Purple	12	Sandy loams
10	0.87	Lilac	16	
10	1.36	Pink	24	Loams

* The ml of water may be measured out with a dropper that has been calibrated to yield 20 drops per ml. Example: 20 x 0.42=8 drops of water.

** Good comparisons can be made with reflected daylight when the standards are set in a test tube rack with a white paper background.

Only the moisture testing technique is offered. Any correlation for field use is left to the user. Accuracy of the method is established by comparing with local soil types at field capacity of moisture.

4 Add *one* drop of the cobalt chloride reagent. Swirl the tube to mix the contents. Match the resultant color with the colors given in Table 1 and record the approximate percentage of soil moisture.

. . . . FOR SOIL MOISTURE

University of Florida

Procedure

1 Carefully remove several samples of soil from the area where moisture content is desired. Pack a measuring teaspoon firmly with the fresh soil and strike off to level-full with a small spatula.

2 Pour the alcohol reagent to the 10 ml mark on a 25 ml graduated cylinder. Add the level teaspoon of soil to the 25 ml graduated cylinder. Use the spatula to break up the small lumps and to stir the soil into a uniform suspension.

3 Filter the suspension immediately through a No. 1 Whatman filter paper. Collect 2.5 ml of the clear alcohol extract in a marked 16 mm x 120 mm test tube.

Test Solutions

Alcohol reagent: Reagent grade isopropyl alcohol. Keep tightly stoppered.

Cobalt chloride reagent: Cobalt chloride solution—35%. Add 35 grams of reagent grade $CoCl_2.6H_2O$ to a 100 ml volumetric flask and make up to volume with distilled water. Store a quantity in a suitable dropper bottle. Dropper should yield 20 drops per ml.

Preparing Permanent Color Standards

1 Select 6 clean screw cap vials (size 16 mm x 120 mm approx.) and follow directions given in Table 1, columns 1 and 2, with quantities of alcohol and water as indicated.

Continued on page 48

WHY NOT EXCELLENT PAPERS?

They *Can* Be Presented . . .

AN ADAPTATION OF AN AMERICAN SOCIETY OF AGRONOMY FOLDER

CHECK YOURSELF ON THESE POINTS:

To Choose The Subject, Ask Yourself . . .

☐ Is it suitable for this audience . . . national and world scientists . . . not just local folks?

☐ Does it contribute new ideas . . . support existing hypotheses . . . contribute other valuable information?

☐ Is the research conclusive enough to present?

☐ How much can be effectively presented in the available time?

To Insure Quality Presentation, Do These Things . . .

☐ Prepare talk outline, slides, (manuscript for publication if possible) well ahead of Society meetings.

☐ To leave time for questions, use only key ideas (not total manuscript) . . . review with coworkers . . . consult references, such as:

1. Casey, Robert S., "Oral Communication of Technical Information," Reinhold Publishing Corp., N. Y., 1958.

2. Cortelyou, E., "Some Fundamentals of Designing Tables of Data," J. Chem. Education 31, 590 (1954).

3. Michener, T. S., Jr., "Illustrating the Technical Presentation," J. Chem. Education 31, 318 (1954).

4. Seinworth, H. W. "Don't Pass Up That Chance to Talk," Chem. Eng. Vol. 58, July 232 (1951).

Present That Paper Effectively

NEVER RUN OVERTIME

5. Seinworth, H. W., "Present That Paper Effectively," Chem. Eng. Vol. 58, Dec., 290 (1951).

☐ Use slides that audience can read and understand.

☐ *Practice* your paper delivery *(before colleagues)* several *weeks* ahead . . . for suggestions on delivery, organization, and slides.

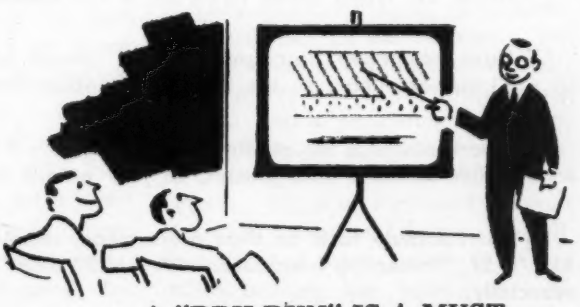
☐ At meeting, check the room and facilities ahead of time . . . have slides arranged and marked right (to prevent sideway, upside down, and backward flubs) . . . be sure your slides work in the projector provided . . . give them to operator in time . . . let chairman know you are there . . . use *less* time than you are given.

The Quality Depends On You!

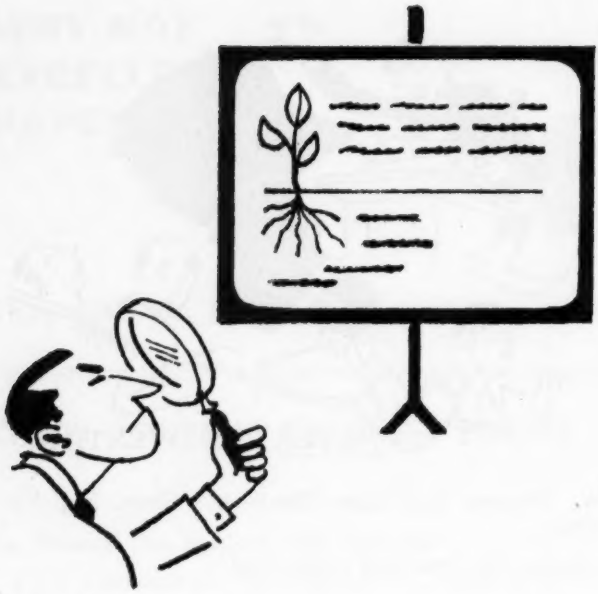
It is an honor to present a paper at Society meetings. The audience's opinion of *you* and your *institution* depends on the *content* and *presentation* of the paper.

Study and adopt practices known to be effective. Remember: A paper is only as good as the *subject matter* and *delivery*.

Study The Proven Methods



A "DRY RUN" IS A MUST



Can *See!*
Can't *Read!*

Ever heard this dialogue?

Speaker: Can all of you see this table (projected)?
Man up front: Can *see . . . can't read!*
Why show your materials if everyone can't see them?

Some Simple Rules On Slides . . .

☐ *One* idea per slide.

☐ Large (bulletin) type or (better still) lettering.

☐ If photographing typewritten material, use no greater area than 3.5" . . . safer to use 2.8" than 4" area.

☐ *Never use* typed tables filling 8½ x 11" sheets!

☐ Have competent photographer . . . mount with standard mask, with 23 x 33 mm opening . . . the 33 mm dimension horizontal when possible.

☐ Good insurance for reading clarity: use *only* if you can read everything on the slide, without enlargement, at your normal reading distance.

☐ For complete facts on slide preparation, see Agronomy Journal 49:109-113, 1957, "Presenting Information with 2 x 2" slides" by H. W. Smith, Table 1 especially.

THE END

A Grade 2 Exhibit

A Grade 2 "Experiment"

"PLANT FOOD MAKES 'EM BIG!"

By Mary Allen **Teacher of Maryland**

Editor's note—Apparently you're never too young to learn the marvels of plant food—at least, from the second grade up.

A Maryland school teacher introduced her pupils to the wonders of modern chemical fertilizer by putting the nutrients to work on plants right before her big-eyed class of second-graders.

What they saw and learned aroused a new interest in their busy little minds—*plant food*—an interest many of them carried home to "plant-food-ignorant" parents in some cases, to interested parents in all cases. Let "Mary Allen" tell her own story.

DON'T undersell our youngsters. They can understand—and appreciate—a lot more than we often realize. I have often seen second-graders take an interest in plant food that would make any parent proud.

They didn't end up as agronomists, of course, nor as soil chemists. But they learned something, some basic facts, planted early in fertile young minds. And in presenting those facts, every effort was made to be accurate, of course, to be clear, and to be convincing. The plant food itself did most of the convincing, and the way the children reacted was a study in young minds buzzing like busy bees with curiosity.

Children find out about plant foods
Visiting garden supply dealer
Testing soil at school garden
Applying plant food to 1 of 2 plants (similar)
Noting differences (with ruler)
Words learned (PRINT)
Nourish
potassium
fertilize
Pupils enjoy tacking up display (using comic covers)
Plant Food
School garden gets plant food
Dad uses Plant food—Junior suggested

A Busy 2nd Grade in Simple Symbolism

A good example is the title of this report—"Plant Food Makes 'Em Big!" It is not original with me. It was the spontaneous reaction of a young grade-school pupil who had seen his first results of plant food usage. He was most impressed. So were his classmates.

The children were in a second-grade class studying a science unit their teacher called, "How Plants Live and Grow." The children and their teacher had conducted a little "experiment" to see just how plants *do* live and what their needs are.

It was all new to the children. The idea of soil testing and soil feeding for better growth began as a great adventure in answering their many questions about plant needs.

After feeding one potted plant adequate fertilizer and another one no

fertilizer, the children were amazed to see (actually see) how plant food *does* make plants grow to their very best—and how lack of it means poor, undernourished, "starved" plants.

Soon they were learning new words from the blackboard and using them with some meaning—words like fertilizer, nourish, potassium, calcium, nitrogen, phosphorus, iron, sulfur, magnesium, etc. After listing the 10 plant foods, they visited a garden supply store to see how fertilizers are made up by identifying the formula on packages.

Then came some delving into books and other literature that uncovered simple, but important facts that impressed the pupils.

For example, they learned that America has wasted about 50,000,000 acres of soil by wearing it out and not replenishing it with proper fertilization. They also looked upon actual fields where erosion had robbed the soil of essential plant food elements and listened carefully as this loss was explained to them.

They learned how 100 bushels of corn will remove from the soil 148 lbs. of nitrogen, 23 lbs. of phosphorus, and 71 lbs. of potassium—and how those materials must be returned to the soil before a successful new crop can be grown.

This aroused their curiosity about their own school garden soil. What condition was it in? They took samples and had them tested to find out. Soon they were applying the needed elements—but, most important, applying what they were learning.

While learning these interesting facts about plant food, the pupils turned to their bulletin board as one way to express their new-found knowledge. Featuring a cover from a "Bugs Bunny" comic book, they symbolized his largest carrot as the one to which he had applied the right amount of nutrients—and with it, cut-out gloves (with green thumbs), miniature rakes, hoes, and spades, as well as pictures of healthy vegetables and flowers that depend on plant food for much of their health.

Before long the children were comparing plant growth in *poor soils* to the growth of frail, undernourished children. And, as children will naturally do, they carried their enthusiasms home, urging their parents to test the home soil for growing "fine specimens for the table and for the State Fair."

Such enthusiasms can be contagious. Inquiries from local farmers and parents with gardens proved more people need to know and apply plant foods now available. All these results stimulated the children's respect for the advances of modern chemistry and biology which have taught us what soils require.

One youngster summed it up this way, "So the plants can eat well and grow hearty."

A simple little thought, just as all early learning is simple. But out of such thoughts a generation of believers are born—in this case, plant food believers, perhaps.

One teacher, at least, hopes more and more of her colleagues will include plant foods and their uses in their units of study, to help young Americans understand more about the soil on which their very lives depend.

THE END

NEW ALFALFA MOVIE

with 2 Shorts

Color

Sound

Time Lapse Growth Scenes

Order From Potash Institute

See Page 35—Coupon

After 2 months' rest in late winter, the pasture is ready for grazing again.

By mid-May it is growing faster than the cows can eat—so surplus is cut for winter silage.

FOUR AND TWO—TWICE A YEAR

By T. S. Buie **Columbia, S. C.**

FOUR months' grazing in mid-winter . . . two months' rest . . . another four months' summer grazing . . . and two more months to store up material for repeating the cycle.

This is the way Furman L. Fendley of Union, S. C., uses his bottomland fescue-ladino clover pasture.

This enterprising young farmer, who left industrial work some ten years ago to return to the soil, planted 35 acres of creek bottoms to the mixture in 1954.

Fendley explains why he likes fescue, "I use it because it has a good root system. Fescue keeps the soil from washing and furnishes as near year-round grazing as any grass I know. It grows good with clover and together they make excellent silage."

When this young ex-industrial worker-turned-farmer first began to operate his dairy, he had a hard time finding adequate and satisfactory pasture for his cows. Now the fescue-ladino combination—kept tender by frequent clipping—meets his need. He says his cattle stay in good flesh and maintain a high milk production level year round.

Well Fertilized and Managed

His success with fescue is due to the relatively high fertilizer application he uses and an excellent system of overall management.

"I apply 800 pounds of 4-12-12 in late February of each year—about the time I move the cows to a temporary pasture," he explains.

And he regulates the amount of additional nitrogen applied during the early spring and summer by the ratio of grass to clover. What he tries to do is keep the grass-legume mixture just

Just 17 days after H was cut, the fescue-clover pasture is ready for grazing.

After another 2 months' rest in fall, by late October the pasture looks like spring.

. . . as young South Carolina dairy farmer uses adequate fertilization—including 800 lbs. 4-12-12 per acre—to insure 4 months of profitable winter grazing.

right, with as few weeds as possible.

By mid-May, the fescue-clover pasture is at its peak, lush green forage knee-high or better. Since the cattle cannot keep it down at this stage, Fendley cuts the surplus for silage or hay—fortifying himself for those few winter days that he cannot turn the cows on pasture.

Fendley does not make the mistake of grazing this permanent pasture through the fall. He knows that it must be given time to prepare for winter. So, in early September he again shifts his cows to temporary grazing areas.

By November, this low-ground pasture is back where it was in the spring.

Looks Good to Him—And Better to the Cows

And if the green luscious forage looks good to him, how must it appear to the hungry cows faced with the task of converting roughage and concentrates into milk each day?

Fendley's cows really like the fescue-clover combination and show their appreciation by filling his milk pails morning and night.

This young farmer knows that he cannot expect good grazing from a pasture 8 months out of 12 without proper treatment. He knows that to get the kind of grazing he wants—and his cows need if they are to give the quantity of milk he expects—he must apply plenty of fertilizer of the right kind.

Every 3 years he sends soil samples to Clemson College for testing and then applies the kind and amount of fertilizer and lime the test indicates is needed. And, of course, he clips, sprays, and otherwise treats his pasture as it should be treated in order to get the most from it.

THE END

Continued from page 39

TABLE 2: COMPARATIVE VALUES OF THE PERCENT SOIL MOISTURE BY COLORIMETRIC AND OVEN-DRY METHODS

Soil Type	Texture	Sample Number	Estimation of Field Capacity by Colorimetric Quick Test	Field Capacity by Oven-Dry Method
			±%	%
Kanapaha f.s.	Coarse	1	6	5.0
		2	5	5.3
		3	5	5.1
Arredondo l.f.s.	Medium	1A	16	14.7
		2A	17	15.1
		3A	15	14.4
Fellowship sandy clay subsoil	Fine	1F	23	26.0
		2F	25	25.8
		3F	24	22.0

2 Use a graduated pipette or calibrated drops to measure out the quantity of water.

3 Add 4 drops of the cobalt chloride reagent to each of the 6 vials, to develop the color shown in the table. The percentages in column 4 have been calculated to be equivalent to the soil moisture test.

Experimental

To test the accuracy of the colorimetric method for soil moisture estimation, several samples were gathered in the field with moisture at field capacity.

Kanapaha fine sand for coarse texture, Arredondo loamy fine sand for medium texture, and Fellowship sandy clay subsoil for fine texture were used to represent the different textures. The colorimetric method and the gravimetric method were conducted on each of the soil samples to determine the percent of moisture at field capacity.

The results are given in Table 2.

Readings for the coarse textured soils were somewhat easier to estimate since the change in the shade of blue color is more pronounced in this portion of the range. The ease of estimating moisture in coarse textured soils is an advantage of this method.

THE END

REPRINTS

HANDBOOKS

COLOR FOLDERS

Available for Teaching, Advisory Use, and Sales Service . . . Order Before Supply Runs Out . . . Convenient Coupons, Pages 33-34

Matrimony puts an end to more petting than all the police put together.

An old mountaineer and his son were sitting in front of the fire smoking their pipes, crossing and uncrossing their legs. After a long period of silence, the father said, *"Son, step outside and see if it is raining."*

Without looking up, the son said, *"Ah, Pa, why don't we jest call in the dog and see if he is wet?"*

Criticism is something you can avoid by saying nothing, doing nothing and being nothing.

Fatal typographical error! Postal to wife from vacationing husband, "Having wonderful time. Wish you were her."

The honeymoon is over when he phones to say he'll be late to dinner—and she's already left a note that it's in the oven.

An exasperated salesman abandoned his car in a no-parking zone, and left this note:

"I've circled this block 20 times. I have an appointment and must keep it or lose my job. *"Forgive us our trespasses."* Upon returning, he found this note: "I've circled this block 20 years. If I don't give you a ticket I'll lose my job. *"Lead us not into temptation."*

When a man and woman marry they become as one. The trouble starts when they try to decide which one.

How he wonders at a girl's
Curves and skin and golden curls
How he wonders, like a heel,
Just how much of her is real.

An old farmer made a trip to the city and decided to startle the wife by appearing in brand new raiment. To save wear on the new suit he placed it in the back of the wagon. A few miles from home he took off his old clothes and tossed them off a bridge into the river.

Reaching for the new clothes, he was surprised to see that they had dropped out of the wagon and were floating down the river.

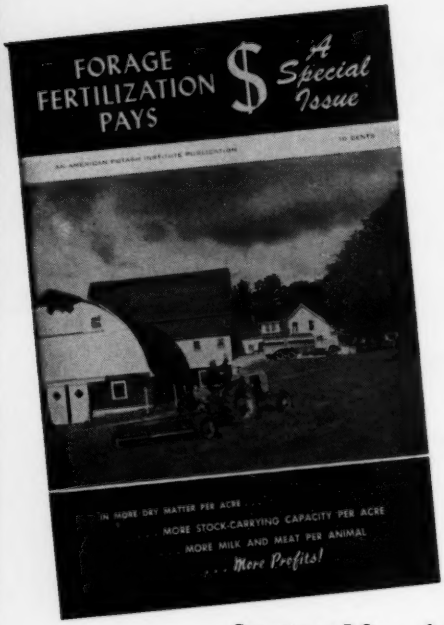
"Giddap, Maude," yelled the old man, pulling down his shirttail as he realized his plight. "We'll surprise her anyhow!"

A hillbilly spotted a motorcycle, the first one he had ever seen, coming up the mountain road. He raised his rifle and fired.

"Did you get the varmint?" his wife inquired.

"Hit it, didn't kill it," he replied, "I can still hear it growlin, but I shore made it turn that pore man loose."

It has been estimated there are over 30 million laws in the world trying to enforce the Ten Commandments.


FORAGE FERTILIZATION PAYS
$
A Special Issue
MORE DRY MATTER PER ACRE
MORE STOCK-CARRYING CAPACITY PER ACRE
MORE MILK AND MEAT PER ANIMAL
. . . More Profits!

A NEW HANDBOOK FOR TEACHING ADVISORY USE, AND SALES SERVICE

10¢ per copy
$10 per 100

Up to 10 Copies Free Official Advisors and Fertilizer Firms

Name_____

Position_____

Address_____

For quantities above stated free policy: **$**_____ **attached**
Bill me $_____

Department B.C. American Potash Institute 1102 16th St., N.W. Washington 6, D.C.

Also See Pages 33 to 36

Better Crops
WITH PLANT FOOD

IF NOT DELIVERED, return to

AMERICAN POTASH INSTITUTE, INC.
1102—16th St., N. W., Washington 6, D. C.
RETURN POSTAGE GUARANTEED